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One Answer to an Old Question

A naturalist-artist gives his views on the development of thought processes in animals

By WALTER J. WILWERDING

Illustrations by the author

It is generally accepted as a fact that animal action is impelled by instinct alone. I believe the reason for this to be that the general public, knowing little about animals, takes the old beliefs for granted. After all, just what is instinct? My dictionary defines it as: "A tendency to actions which lead to the attainment of some goal natural to the species; natural and unreasoning prompting to action; as, the web-building instinct of spiders. As distinguished from habit, instinct is not dependent on the individual's previous experience." In other words, animals do some things naturally, or by instinct; other things they do through habit acquired by previous experience.

I will ask special consideration of the last sentence of the dictionary definition, for it is my contention that, in order to learn through previous experience and acquire a habit, an animal must go through the process generally known as thinking. A child that burns its fingers in a fire, if it is smart, will keep away from fire the next time, knowing it will be burnt. How does it know? Certainly by remembering the previous experience, and one remembers with one's brains, or by thinking. Without thinking, there can be no memory, and without memory there can be no profit from previous experience. The natural conclusion is that thinking is necessary if one would profit through experience. If I appear to overemphasize this, it is because I wish the reader to keep it well in mind.

Too often, those who study animal behavior use low forms of animals for their experiments. Thus, I find one man experimenting with rats, and another who, in discussing animal behavior in comparison with man's reasoning powers, uses a wasp to illustrate his point that animals act through instinct alone. Dogs are also frequently used as examples, and, although dogs are highly intelligent, there seems to be a general misunderstanding about the status of their intelligence, for they are not the most intelligent of animals. The great apes—the orang-utan, chimpanzee and gorilla—really rank much higher in intelligence than dogs.

To use insects and rodents to illustrate the development of the animal mind is about as sensible as to use the Australian bushman as an example of the high intellectual development of man. In all fairness to the lower animals, the more highly developed forms should be studied; and, if there is to be any comparison between them and human beings, the comparison should be made with some low form of human such as the Australian bushman; for it is manifestly unjust to compare the animal mind with that of the highly educated human.

That the big apes make good use of their brains has been demonstrated frequently enough. I had a striking example of this in an orang-utan that was owned by a friend of mine.

This particular individual disliked being stared at. He appeared to have a well-conceived idea that his private

"—AND DRIVE IT TOWARD THE WAITING MEMBERS OF THE PACK"

life was his own. One day, my wife and I went to visit him and I took my camera with me. As soon as I opened the camera, the orang-utan came to the bars of his cage and spat on the instrument. When I insisted on taking a close-up picture, he spat on me.

This orang-utan had a blanket with which he covered himself at night. Hoping to drive us away, he got his blanket and climbed the bars of his cage. At the top of the cage, there was a six-inch opening between the bars and the ceiling. Reaching out, with the blanket dangling from his hand, the orang-utan tried to strike us with the blanket. The blanket caught on a piece of wire that was twisted about the bars below. Most children would have pulled at the blanket until it tore, but not this orang-utan. He looked thoughtfully down; climbed down to unfasten the blanket; went up and pulled that blanket back into the cage. Here was an obvious case of an animal performing a reasonable act after reasonably thinking about the act to be performed.

Here may I assert that animals not only use their brains for thinking, but their thoughts are often coherent. That animals think is obvious to anyone who owns a dog or other pet, but few will give them credit for coherent thought. This perhaps is because thoughts of animals are readily distracted by seemingly trifling outside influences and they do not appear to concentrate their thoughts.

At the Bronx Zoo in New York, there is a gorilla who occupies the same quarters with a chimpanzee. Last year, my wife and I happened past their outside cage and, seeing the two occupied with something, we stopped to watch. The floor of their cage is of concrete and a crack runs along the middle. Dirt had accumulated in this crack. The chimpanzee had somewhere obtained a short piece of wire and was carefully digging the dirt from the crack in the floor. With its hands, the gorilla was scooping the dirt into little mounds as the chimpanzee loosened it. They paid no attention to us, but kept at their task as though it were serious work that must be well done. Here was an animal using a wire as a tool. Certainly neither instinct nor habit had anything to do with this, for the chimpanzee was working in unnatural surroundings with a man-made tool. These animals were unquestionably concentrating their thoughts on what they were doing.

It is often argued that animals are incapable of deliberate planning; that their hunting, for instance, is simply a matter of wandering about until they run into something. However, the wild dogs of East and South Africa—bat-eared, hyena-like animals that run in packs—hunt their game like a pack of carefully-trained hounds. That there is deliberation and forethought in their hunting plans is evident from the fact that they take the wind direction into account, as well as the lay of the land and the direction in which the game is most likely to run. Having selected their quarry, some members of the pack distribute themselves along the route by which the game is to be driven. Others cut their victim from the herd and drive it toward the waiting members of the pack. The whole procedure is so uncannily orderly that it fairly makes your nerves tingle to watch it. To the accompaniment of their baying, "Hoo, hoo, hoo!," the game is driven relentlessly in a circle, for the pursuing wild dogs crowd it on one side to keep it turning. This enables tired members of the pack to drop out of the chase and be relayed by others. After resting, these again join the chase and relieve others who have become tired. This keeps the pursuers ever fresh, while the victim is given no moment of respite. If their

victim runs through a herd of other animals, hoping to throw its pursuers off, the wild dogs pay no attention to these others, but keep after their first victim.

Once, when I was alone on the veldt, an antelope tried to put me between it and a pursuing wild dog pack, by running within touching distance of me. Armed only with a shotgun loaded with bird-shot, I at once began laying down a protective barrage. The wild dogs simply circled warily about me and kept after their prey.

Ordinarily that little antelope would not have approached within a hundred yards of me. With the fear of speedy death in its mind, it had desperately run past and around me. Antelopes often try this trick to throw wild dogs off, but usually they run through herds of their own or another kind of antelope. This plainly indicates that the pursued ones also do their share of thinking, when their bitter time is upon them and death crowds closely at their heels.

Further evidence of careful planning may be seen in watching the hunting of jackals and our own coyotes, which often hunt in pairs, one lying hidden, while the other drives the game toward it. Lions also frequently practice this. I had occasion to study the hunting methods of lions in Africa and was interested in seeing how, when confronted with the problem of obtaining cattle confined in a native *manyatta* (corral), some of the lions would approach the corral from the windward side, roaring loudly, so their scent and the sound of their roaring would frighten the cattle into stampeding through the flimsy fence of thorn branches, to be pulled down by lions lying silently in wait down wind.

Once, when my wife and I were encamped at Lalgarjin in Tanganyika, three lions attempted to carry out such a maneuver at a nearby Masai *manyatta* and were only deterred by the alert warriors who surrounded the cattle and kept them milling in the centre. The disappointed lions retreated to near-by bushes and waited until the Masai drove their cattle forth to graze next morning, when they pulled down two cows. This bears the earmarks of deliberate planning. Instinct arises from natural conditions, while a fence built to enclose cattle is an artificial condition introduced by man, with which the lions must cope by the use of their thinking faculties.

In one locality in East Africa there was a large herd of giraffes that would allow me to approach within a dozen yards. They had never been shot at and had no fear of me. If animals are impelled to action only by instinct, then instinct should have told these giraffes that man is an enemy, for "instinct is not dependent on the individual's previous experience." In another more settled district, where settlers frequently shot giraffes that came on their land, the animals ran from me as if I were the plague. Experience had taught these giraffes that man is an enemy.

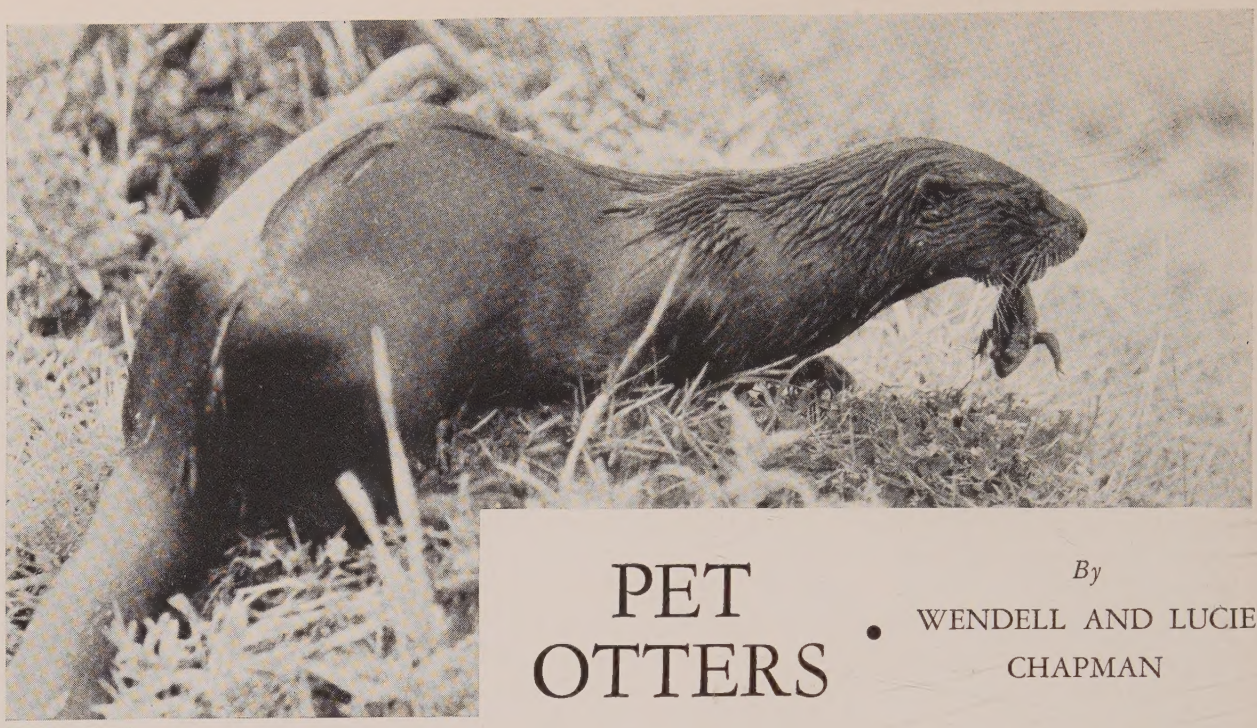
I know of several districts in East Africa where white hunters dare not hunt elephants, for the animals charge on the slightest scent of a white man. Yet natives go about their affairs in these places with apparent impunity. This condition is the result of too much hunting, killing and wounding on the part of white men. As a result, the elephants have obviously declared an open season on white men. I know of one man who went into one of these districts against the advice of others and lost his life as a result of his foolhardiness.

These giraffes and elephants learned about white men through previous experience only. Unless my dictionary is wrong in its definition, previous experience and instinct have nothing in common. If, therefore, the elephants did not attack through instinct, what did impel them? You might answer—and quite properly—that the elephants knew the white man as an enemy, to which I can only answer in turn, that no one, man or animal, knows anything unless he is able to use the brains that are given him.

The Pant-leg Wren Nest

CAUGHT in a shower while vacationing at his summer cottage, Mr. C. H. Manley, a member of the Audubon Society at Pittsburgh, Pa., hung his slacks over a line to dry.

When he went after them a few days later, he found that a pair of wrens had appropriated them for home-building purposes. Desiring to lend full cooperation to such an industrious couple, he erected a perch for their convenience, staked down the trousers legs to prevent damage to the nest by the wind and left the trousers for their use. With this help, the brood of three was raised to maturity.



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PET OTTERS

By
WENDELL AND LUCIE CHAPMAN

SHOULD you see, while motoring along a country road, a pair of otters galloping about through the grass, their mouths open and their elongated bodies arched eight inches above the ground as they hold off a water spaniel and a large hound, you would surely stop to watch them. Should the spaniel dodge aside and leap into the air to avoid the rush of these twenty-pound members of the weasel family, only to be rolled to the ground under the impact of a third otter tackling him by the ear, and if more and still more animals appear until half a dozen dogs and a dozen otters tumble in tangled heaps here and there, you might begin to doubt your eyes. Then should you see the limber, seal-like bodies glide over and under the dogs, a cat rush out of the weeds and leap at a conical tail, a raccoon with arched back race after her, you will probably pinch yourself to find if you are dreaming. If the vision still lingers and you see a man walk up to one of the milling piles, lift a lashing otter by the shoulder hide and hold the animal to his cheek for a kiss, then you will probably fear that you have lost your mind. Actually you are perfectly normal. You have merely stopped beside Emil Liers' farm on the Mississippi River in Minnesota, and you are watching a daily frolic of his remarkable pets.

As the wrestling goes on you feel sorry for a sturdy airedale that is pivoting on his ear and whimpering at the grip an otter has on his nose. Soon the otter lets go and the dog, with tail wagging and mouth open, pounces upon the otter, nabs him by the throat and again tries his futile best to pin down the slippery, squirming comrade. You realize that the dog's yelps are all in the day's fun. Coonie, too, seems to be getting badly roughed up as his sharp face protrudes from an uncertain number of interwoven otters, his soft voice churring "nuff". But he manages to worm his lip from an underset, shark-like pair of jaws. Upon breaking loose he hops about, arms spread like a wrestler, and tackles the same otter, any otter, or all the otters. The cat runs from a creature four times her weight. He leaps upon her and bears her to the ground. You wonder how she can possibly survive the rough handling. But in an electric instant, you see her paw raised, claws spread. The otter rolls off, speedily, apologetically, his head turned away, his eyes closed as he retreats from that familiar paw full of needles.

The moment you step out of the car, the otters, like weathervanes, wheel toward you. Some rear and stand on a firm tripod of hind legs and tail, the better to see you over the grass. With backs arched, two gallop straight for you. One rears, embraces you above the knee and clings firmly to peer and sniff. From the friendly tone of her

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THE OTTER GOES IN FOR WRESTLING WITH A PATIENT OPPONENT

It's a rare dog that can hold its own in a frolic with a twenty-pound otter. Above, an otter at lunch. This mammal eats fishes, crawfishes, frogs, insects, and snakes. It is especially fond of eels although it cannot live on an exclusive fish diet

COMRADES: A CUB OTTER AND A KITTEN

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When the play becomes too rough the kitten can always resort to a show of claws, which are held in high respect by the otter playmates

murmuring you venture to lean over and stroke her. You have never before felt an animal with a coat so firm, yet so silky. Her mate sidles around, eying you and examining the car. Just as you begin to feel acquainted, away goes the pair to join the other otters. You call. But they are no longer interested in you. Some that have advanced cautiously, retreat with the pair. Others run behind their master, stretch their necks, and mutter at your approach. Such is the beginning of a typical visit to the Liers' farm.

For more than a decade Emil Liers has been rearing otters. He is one of the few who have succeeded in breeding them in captivity. Although they do not breed every year—the reasons for failure remaining a mystery—he can successfully rear them, and has come to know them as no other man does. One of the first discoveries he made about otters is that they cannot live on an exclusive fish diet. Many of the first ones captured died within a few months, before he found that they thrived only on a carefully balanced diet of fresh vegetables, cereals, minerals and meat, with fish only two or three times a week. Government analyses of the droppings of wild otters and our own observations of these animals while feeding in their natural state agree with his findings—that otters are omnivorous. In further proof of this, we have seen Mr. Liers take captive animals that had become so emaciated and mangy that they hardly resembled otters, and invariably within a few days they showed improvement. Within a few weeks they had almost completely recovered.

Perhaps, on your visit, you may have the good fortune to go for a day's hike along the river or up a creek with this man and his pets. You see for yourself what natural food these animals prefer. The otters root in the soft earth under trees or bushes for grubs or angleworms, or dig in the mud of pools and stream banks for roots, insects, or crawfishes, or nose about in the grass for frogs, bugs, or snakes. You drop to your knees and crawl through the grass, grabbing here and there until you catch an elusive jumper. Strangely, all the otters will have missed this one. Eagerly you try to give it to one after another, only to discover that it is not a frog but a toad, which none of the otters will touch. You watch them spread out to comb the stream. Uninterested they swim past fingerling fishes. Now and then they bob to the surface with a large fish. But their craving for eels and crawfishes far overpowers their taste for game fishes. And, incidentally, during their feeding you are impressed by their good manners. When one stops to eat a choice morsel, the others pass him by without trying to snatch it.

On this hike you learn for yourself that the otter is one of the fisherman's best friends. When crawfishes and eels are present he takes more of them than he does of game fishes. Crawfishes, if allowed to multiply without natural checks, eat the food upon which fish fry depend. Eels are greedy destroyers of small game fishes. Yet, in spite of the otter's invaluable service to fishermen, he has been condemned as a "varmint" and all but exterminated throughout most of his former range. And after the "varmints" have all been trapped out to "protect" the fish, and the balance of Nature has been upset, thereby allowing the crawfishes and eels to multiply in unnatural numbers, the angler wonders why so few of the planted fish are left for him!

Before you have followed the otters far you will notice that differences in disposition and temperament show more plainly even than the differences in size, and variations in color from light to dark brown. You watch Neptune, a regular old fuss-podge. He waddles hesitantly along the shore while the others gallop toward the pond, drop on their bellies and, chuckling with delight, go coasting in the mud to the water. But Neptune follows reluctantly, body arched high, tail raised. He walks over the mud with a feline annoyance at getting wet. At the water's edge he patters about before the plunge, making as much ado as if he were taking a cold dip and did not have a warm waterproof coat to keep the water from his hide. Once in, he swims and dives as gracefully as the others, his vigorous movements and contented tones showing that he is enjoying himself fully as much. Neptune,

THE LIERS FAMILY AND THEIR REMARKABLE PETS

Experience has shown that about one half of the otters have dispositions suitable for pets; the rest have untamable habits

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when following his comrades into the water, is always as fussy as an old hen with a brood of ducks.

You notice that Nippers, an orphaned cub otter, follows Neptune about with worshipful devotion. Tarka and Tarquol, the young pair who ran to meet you when you stepped out of the car, are usually side by side. While you sit on the grassy bank watching them, Mr. Liers tells you more about the varied personalities, the likes and dislikes of his pets. With Tarka and Tarquol it seemed to be love at first sight. The moment they met as half grown cubs, they were attracted to each other. This attachment strengthened as they matured. Tarquol will seldom fight, but her handsome partner, Tarka, makes up for her mildness, especially if a strange dog or otter is looking for trouble. He once put Marinuka in her place for picking on Tarquol.

Marinuka, who was born ten years before, in captivity, is devoted to the Liers family. She pries the door open with nose and paws, enters the house and chatters chummily to Mrs. Liers until picked up so that she may nuzzle her mistress's face. Marinuka has a penchant for being rocked to sleep. But notwithstanding gentleness with the Liers family, she resents every strange person or otter who appears at the farm. She was kept away from Tarka and Tarquol until they were nearly grown. The first time she saw the sleek, dark brown Tarquol, she tackled her. Tarquol would not fight back. She tried to run away. When overtaken she begged for mercy. But the jealous Marinuka bit and lashed furiously until her master pulled her off. Tarka, also a stranger to Marinuka at that time, watched the whole affair from a cage. The following day when he was let out to meet Marinuka, he completely ignored her until a yard away. Then zip! He grabbed her by the nose and rolled over and over. Marinuka broke away and ran for her master, but Tarka pursued and grabbed her again. Mr. Liers waited until Marinuka had been given a good lesson and then he rescued her. She clung high on his shoulders, snuggled against his neck, nuzzled his face and muttered down at Tarka, who was rearing to snap at her tail. From that day on, whenever she saw Tarka loose, she ran. It was over a year before the feud died sufficiently so that Mr. Liers could take Marinuka, Tarka and Tarquol on the same daily trips. Even now they must be kept busy in order to have peace. If the three are left alone in the yard, Tarquol sets her mouth smugly and begins to point her nose at Marinuka. This indignity the latter positively will not tolerate. When Marinuka pounces upon Tarquol for the teasing, then Tarka steps in and mauls Marinuka. Unwilling to take a chance of having Tarka injure Marinuka, Mr. Liers always stops the fight.

Marinuka was the first pet on the farm and is loath to share her prior rights. Therefore, she is tyrannical with any of the other otters that she can whip. She avoids those she cannot whip, however. There is only one otter on the farm which can really get along with her, and that is Blackhawk. He was captured in Minnesota when about twenty years of age. If that estimate is correct he is now more than twenty-five, and, judging from his present condition, may live for many more years. Although otters captured as adults usually cannot be tamed, this large mild-natured one has proved an exception. Whenever put with another otter Blackhawk turns his back to ward off the usual attack and answers growls with soft murmurs. In no time at all he wins over the hostile one, regardless of sex. Although he is a powerful fighter and still in his prime, he prefers to talk the other fellow out of it. Even Marinuka cannot resist his soothing influence. She has come to adore him and is jealously abusive when she smells the odor of a rival on his coat. But usually he is able in his chuckling otter way to explain such matters and soon they are hunting or playing side by side, their murmurs suggesting a happy couple making plans for the future.

After trudging behind the otters through the willows you return to the Liers' farm and sit on the steps of the porch. The otters run about over the sprinkled lawn, drop to their bellies and coast on the wet grass. In consideration of you, Mr. Liers has taken them only a short distance—five miles—and they are still brimming over with energy. You try to call them to you, but they ignore you, or dodge you, on the way to their master; chuckling to him they drop by his side panting. While you are enjoying their

LIKE A WRESTLER LOOKING FOR A STRANGLE HOLD

The dog well knows that before he can grab the otter his playmate will have him. The strength and vitality of the otter are amazing

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playfulness and admiring their loyalty to their master, he tells you of different occasions when they have displayed equal loyalty to one another.

One of these many examples is the story of Eureka and her mother. The young otter was allowed to remain with the mother for two years, this unusually long association being possible because no cubs were born the second spring. Although grown, Eureka continued to follow her mother about and to take the occasional punishment that headstrong young otters need. Then one day the mother was sold. Eureka showed such concern over losing her mother that she was kept caged lest she run away. Night and day she uttered the sharp chirps of an otter in distress, pacing the cage. Day after day she continued to call for the mother. Nothing her master could do calmed her. Finally one morning Mr. Liers let her out, hoping that freedom would help her forget. She soon disappeared from the yard, and by evening had not returned. Nor had she been seen by the next morning. Tracking her to the Mississippi River, Mr. Liers searched either bank above and below the point at which she had entered, but not a trace of her did he find. Over a mile downstream he discovered where she had first emerged, had run along the muddy shore and stopped here and there to examine the mud for signs of her mother. On and on she had wandered, alternately returning to the river to swim and emerging to run on the shore. For several days Mr. Liers searched the river banks and islands, calling for Eureka, but never hearing the familiar answer that she and other otters always gave when he whistled or called.

Fifteen miles downstream he found her tracks on an island, but no glimpse did he catch of her. At last he gave up the search and returned home. On the sixth night after her disappearance, he heard a chirp outside his door. When he arose and turned on the porch light, there lay Eureka, tired, thin, her feet worn raw from her wanderings. She was holding them up off the porch floor to ease the pain. She relaxed in his arms when he picked her up to put salve on the feet. After a hearty meal, she willingly retired to her cage. During the next few days, whenever let out, she looked toward the river and chirped for the mother—still unable quite to resign herself to the loss. But, although sad at heart, she left no more to search.

In her bereavement she turned to Marinuka, who immediately attacked. Although larger than Marinuka, Eureka only dropped to the ground and whimpered at the severe chastisement. She arose and followed her mauler, murmuring meekly as she had to her mother after corrections. Her humility pleased Marinuka, who strutted about and chattered in her gruffest tones. Every day or so Eureka was mauled, for no apparent reason at all, unless Marinuka was proving something which she could not quite believe—that an otter larger than herself could be so subservient. Each time Eureka took the unreasonable bitings and groveled in the dust Marinuka's voice proclaimed her overbearing pleasure. For almost a year this continued. Then one day Eureka turned on Marinuka and gave her a thorough thrashing. From that moment all friendship ceased and another feud was on. From that moment, also, Eureka became self-sufficient.

It is difficult to break away from the lively otters and Mr. Liers with his amusing tales about them. Before you go, you learn that less than half of the otters that he rears are suitable for pets, the others showing a tendency to bite from the time they are cubs. Instead of growing more tractable each day as the mild natured ones do, these wild natured ones become more unmanageable. The fact that less than half of the otters have natures suitable for taming, together with the difficulty in breeding them, explains the rarity of these intelligent animals as pets.

As you leave the farm, you feel that you have glimpsed into a new world. The long, lithe creatures so playful, so loyal, so positive in their likes and dislikes, and each so different from the others, will ever after seem like a strange little people—which in reality they are.

MOBILE'S FAMOUS AZALEA TRAIL IS A MECCA FOR FLOWER LOVERS
Banked with azalea plants ranging from two to twenty feet in height, the Trail, lined with century-old oaks and magnolias, winds through picturesque streets for fifteen miles

Azalea and Camellia Time in the Deep South

By ANNABELLE NEUSBAUM

AZALEA time in the deep South is one of great joy and exquisite beauty. When the azaleas, evergreen shrubs of delicate foliage, burst their buds, masses of flowers cover the bush until, its foliage hidden, the entire plant is a glowing mass of living color.

The gracious charm of old Mobile, with her quaint old streets and spacious avenues lined with magnificent century-old live oaks and magnolias, provides a perfect setting for the azaleas and camellias. Today, Mobile has a beautiful "Azalea Trail", a road some fifteen miles long that leads one through streets literally banked with these flowers. The plants range from two to twenty feet in height, the reigning color being a glorious deep pink. The visitor will find many of the oldest gardens marked with a "welcome" sign typical of southern hospitality, and there one may view the oldest and most beautiful bushes. The azaleas and camellias do not show the marks of years except by growing larger and more sightly. The huge evergreen oaks show the toll they have paid as they grow gnarled and ancient, while the azaleas bloom in beauty always.

The history of the azaleas is closely interwoven with the romantic history and traditions of the old South. They came to the new world shortly after Bienville founded Mobile in 1711. From old family records we find that Francois Ludgere Diard, native Mobilian and direct descendent of one of the original settlers, returned to France to visit relatives in Toulouse. At the time of his visit the azaleas of southern France were blooming. He was so impressed with their dazzling splendor that on his return to the new world he brought home three varieties: a deep glowing pink known today as Pride of Mobile; a lavender-pink one, and a snowy-white one. Today, gorgeous specimens of these original plants can be seen in the oldest gardens—some of them perhaps a century and a half old, twenty feet high, and spreading out to a diameter of one hundred feet. Today they are found all along the Gulf Coast from Texas to Florida up the Atlantic seaboard to South Carolina.

Each individual blossom of the azalea is a thing of beauty. It is a delicate flower of lily-like form with deeper colored throat and long graceful stamens and pistil. Glorious red shades predominate, ranging all the way from the most delicate pink to flaming cardinal. The ones pictured,

AN AZALEA IN FULL BLOOM

Old age seems to enhance the beauty of the azalea rather than to detract from it; the larger the bush, the more numerous and beautiful the blossoms. When in bloom, the masses of flowers so cover the plant that not a trace of the foliage can be seen

Azalea indica, came to southern France from China, its native home, while the dainty dwarf azalea is from Japan.

Camellias are surpassingly beautiful when in flower, and the foliage is a glossy dark evergreen. There are perhaps a thousand different varieties—many importations coming from Japan, China, and France—besides the new varieties that have resulted from different soil conditions and climate, and skilled hybridizing. There are many types and colors, ranging from white to the deepest of reds. Every shade of pink is represented, while some are variegated with striped or mottled petals. There are singles, semi-doubles, peony-flowering, pompons, and shaggy and full doubles of every conceivable type and coloring. The peony type is large, with the center petals intermixed with golden stamens. The full double measures about five inches across and has hundreds of petals. The japonicas, as we call them in the South, begin blooming in December and burst into full radiance in the early spring.

The general impression, and a most incorrect one, is that the azaleas and camellias require expert and expensive care. They do require care, but after a thorough preparation of the planting beds they practically care for themselves and do not need as much attention as the ordinary garden roses. Azaleas require an acid soil, and if your soil is not acid, it must be made so by special preparation. Even here, where the azaleas are so at home, we prepare the soil for them. After selecting the planting location, a place that has good drainage and plenty of sun, we first remove all the soil, allowing generous room for the spreading rootlets. The planting bed is then filled with a mixture of good sandy loam, peat moss and mulch. Natural woods soil or a loamy muck are ideal for the basis of the planting beds. If it is difficult to obtain either of these, pure clean sand mixed with equal parts of peat moss proves satisfactory. A small amount of cotton seed meal may be added as extra plant food, but under no condition should commercial or other fertilizers be used. The azaleas do not take kindly to forcing and more is lost than gained.

If you still have doubts as to the acid condition of the soil a small amount of aluminum sulphate may be added at the rate of one pound every ten square feet. A mulch of three to four inches of leaves from hardwood trees—the leaves of the live oak are ideal—or a mulch of peat moss, must be maintained at all times. The mulch holds the moisture and protects against the burning rays of summer sun and the cold of winter, and provides the essential plant food upon which the azaleas thrive. Also, the mulch keeps down weeds and grasses, which should be removed from the beds by hand. Although the azaleas must be kept free from weeds, they are so shallow-rooted that the delicate rootlets are injured by cultivation. A plentiful supply of water is necessary during the summer and dry seasons. The bushes should be sprayed gently every evening. While not subject to troublesome plant diseases or insects, red spiders or ants sometimes may invade the beds. However, these are easily controlled by a thorough spraying with clear water. The culture and care of the camellia is identical with that of the azalea, and they, also, grow more beau-

tiful and luxuriant with the passing of the years.

It is a delight to wander along the creeks and little rivers because the swamps are filled with wonderful wild flowers and heavenly odors. Mirrored in clear waters I find a rare swamp azalea, *Azalea serrulata,* snow-white and with a piquant spicy odor; farther up on the banks grows a glorious flame species, *Azalea austrina,* and, light pink and deeper pink, *Azalea canescens.* Mountain-laurel, *Kalmia latifolia,* is blooming in perfection with its pinkish-white blossoms. Every path is bordered with that spicy sweet shrub, *Benzoin,* while everywhere, twined on sweet bay, water oaks, live oaks, dogwood and cypress, wherever it can find a foothold, are growing yellow jasmine, golden and fragrant as the name implies.

Tradition and folk lore will tell you the monks of the old world carried the camellias into the gardens of the monasteries and that the nuns cultivated the azaleas in convent gardens. The exquisite blossoms, it is said, are the love and prayers returned in a glory of color each spring to renew hope and faith.

To me the glory and beauty of the azaleas and camellias in bloom are a benediction of peace and happiness. All my fears and doubts are gone, and I know the presence of God.

EACH AZALEA BLOSSOM A THING OF BEAUTY
Red shades predominate, ranging from delicate pink to flaming cardinal, with deeper colored throat and gracefully poised stamens

A Rare Grape Fern

By H. W. HIGMAN

THIS little grape fern, *Botrychium pinnatum,* was found under a group of alders in one of the valleys in the Cascade Mountains of Washington.

The specimen in the photograph was about six inches high. Although the casual observer would never dream that this small, sturdy plant was a member of the fern group, it belongs to the adder's-tongue family, which, besides the lovely little species that has given its name to the family, includes all the moonworts or grape ferns.

This species is one of the rarest of the dozen or so grape ferns of the Pacific Northwest. This is certainly true if the place in which we found it is a typical location. Thousand foot cliffs rose abruptly a few feet from us and long fingers of mixed maple and alder thickets that stretched down the slopes made traveling difficult. Only the presence of a dwarfed specimen on the narrow trail caused us to stop and search the vicinity for others like it. Had we passed two weeks later, the trail would have been so overgrown that we would have missed it.

SEA IGUANAS OF GALAPAGOS

Pacific Isles Show Us the Survivors of a Lost World

By WOLFGANG VON HAGEN

Photographs by the author

This is the first of two articles concerning the strange lizards of the Galapagos Islands. The second will appear in an early issue.

ON THE lava rocks that form the shores of the Galapagos Islands, that curious group that lies seven hundred miles off the coast of Ecuador, and where the animals of the youthful world seem to have lingered, live great colonies of an iguana found nowhere else in the world. This is the so-called sea, or marine, iguana, *Amblyrhynchus cristatus*. It is marine only in the sense that its sole diet is sea-weed. Being the only lizard that is known to live solely on a product of the sea, it may be considered as representing in a manner the pliosaurs of ancient times, although its line of descent is not clear. These stocky sullen-visaged creatures remind us of the period when the principal animals of the world were reptiles. That was the age of the monsters. Dinosaurs, pliosaurs and other ancient reptiles peopled the earth. They had neither enemies nor competitors and their histories have come down to us only as told by their remains, which are admirably preserved in the rocks. But through some cataclysmal change they perished so rapidly that few of the species were able to adapt themselves to the new conditions. Usually dying in various media that did not pre-

AN IGUANA CLOSE-UP

The warm rays of the sun bring them out to bask on the lava rocks beside the sea

and their open mouths reveal rows of sharp, coral-shaped, tricuspid teeth and a small reddish tongue. They seem very fierce but let the intruder advance a step and away they scurry.

The hind feet of the reptiles are slightly webbed, yet they are not used for swimming. When one enters the sea, the four legs are folded tightly against the body and it becomes as streamlined as the newest ocean liner. Thus the animal makes off through the water, plying the long thin tail as the only motive power. The tail is broad and longer than the body of the animal, and the entire length of the back, from head to tail, is ridged with spines. Iguanas apparently are immune from attack by other animals, for they serve their remains, they left for posterity, on a diminutive scale, a few species to wander in a lost world. Of such ancestry, apparently, are the iguanas.

More lazy than fearless, sea iguanas allow close approach before scurrying to another rock. They make their home on the lava shores of the islands, subsisting on the algae at the water's edge. They are good swimmers, but their slightly webbed hind feet are not used during their marine maneuvers

The sea iguanas are jet black when young, this natural coloring blending with the black basaltic lava rocks that are their home. So perfect is the camouflage that they are seldom seen until they rise up and flee, like leaves scurrying before the wind, before the strange two-legged intruder who invades their home. Many of them are little fellows, six to fourteen inches in length from the nose to the tip of the tail. They will run ahead of you a little way, and when they feel they are at a safe distance, they poise, head erect, extremely dignified, and then blow from their nostrils a fluid that evaporates like spindrift in the air.

The larger iguanas, the yellow males spotted with orange and black, usually rest during the midday heat among the salt water succulents that grow on the shore. If we walked among these bushes, we would likely as not tread upon them. At times I have been startled as one rose up, gazed fixedly for a moment, and dashed for the safety of the rocks. The males measure from forty to sixty inches in length, and are repulsive in appearance. They shake their heads threateningly at a human's approach

tacks from the fishes of the surrounding waters, as they freely cross wide stretches without apparent fear. These swimming excursions are most noticeable at Academy Bay, Indefatigable Island, where we made our headquarters.

The sea iguana never has lived long in captivity. All experiments to feed them under artificial conditions have resulted in failure. They will live for six weeks or more without food, but will resist efforts at forced feeding to the last.

When the tide ebbs, masses of algae are exposed on the rocks, and here the iguanas gather for their daily feeding, where they clutch the lava rocks with their sharp claws and with their keen teeth vigorously tear away the weeds. The food is little masticated, however, but the powerful digestive fluids of the stomach and the intestinal tract extract enough nourishment from their peculiar food to support their needs.

At the beginning of "winter" in the Galapagos, the months from November to February, the female places her half dozen or so eggs in the sand. They are buried in the sandy slopes to a maximum depth of twenty inches. The eggs measure about fifty millimeters in diameter and about seventy-six in length, and have a tough pliable shell. They hatch in a relatively short time, and the young soon take their places with the rest of the colony. As I write this, two males are struggling before me. Their spined heads are locked together like the antlers of fighting bucks, and they are pushing each other about as if in mortal combat. Time is called while they regain their breath, during which there is a great deal of head shaking, and then they are at it again.

The marine iguana is found on almost all the islands of the archipelago. Ocean currents and the distribution of the algae on which they feed help to decide where their homes shall be, yet like the colorful grapsid crab, they are found nearly everywhere throughout the islands. With their cousins, the land iguanas, and the huge tortoises, they take the place of herbivorous mammals. These iguanas, possibly descendants of the giants of yesteryear, and reduced to diminutive size by a chain of unknown circumstances, have survived to pass on to modern observers some idea of the general appearance and habits of the monsters that roamed the earth in ages past.

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The Black Swan

By EDITH M. LAING

TO COMMEMORATE the centenary of Western Australia, a postage stamp that pictured the state emblem, the black swan, was issued.

The first explorers who visited this great island-continent found so many eccentric creatures that subsequent visitors came prepared for almost anything. Nevertheless, when in 1697 a Dutch expedition sailed into the mouth of a river on the western coast, and came upon numbers of graceful birds with glistening black plumage and brightly colored beaks that proved to be cousins of the white swan, the travelers had to admit astonishment. Since the days of the old Romans black swans had been thought to typify a discovery so improbable as to reach the height of absurdity, but here they were.

Swans have always been regarded by travelers as good omens, but, in addition to presaging fair weather, this amazing discovery of a black species afforded one more dazzling tale for the voyagers to relate to the folks back home. The river was promptly named the Swan. Since that time the black Australian swan has been introduced to many other lands.

In their wild state they make their nests among the reeds bordering Australia's few rivers and lakes. Centuries of outwitting the cunning aboriginal with his deadly boomerang has developed in these birds the highest degree of sensitiveness to the approach of danger. Despite its rarity, and the fact that it is the state emblem, the black swan is still pursued as game.

The poetic myth that dying swans sing a death song has been used by many poets. The grace and loveliness of the regal bird have been immortalized by Saint-Saens in his Le Cygne, and the haunting strains of that musical composition have been translated by the world's greatest dancers into the poetry of motion.

In medieval Europe only kings were permitted to keep swans, but since the day of the common man dawned, anyone may go to his city park and enjoy watching and feeding the royal birds, both white and black ones, majestically floating on a sheltered lakelet, perhaps with their baby cygnets nestled in the shining plumage of their backs. One of the writer's happiest memories is of a flotilla of black swans serenely floating on the turquoise surface of a tiny New Zealand lake set in a white, gold and green frame of wild arum lilies.

Patents For Plant Inventors

By HARRY GOLDSMITH

Illustrations from the United States Patent Office

UNHERALDED and apparently unknown to the vast majority of people, a new kind of inventor is emerging on the American scene—a scene that owes its brilliance largely to the patronage of invention and inventive genius since the establishment of the Federal Government.

The newcomer is the "plant inventor," who, legally, came into existence some six years ago when Congress unanimously passed a special act, the object of which was to encourage people to "invent" new plants, fruits, flowers and trees for the enjoyment and betterment of mankind.

To accomplish this object, the act provided that anyone who invented or discovered a new variety of plant could obtain as his reward a patent that would secure for the plant inventor the same legal protection and privileges as a patent on a new machine, compound or process. So, today, the plant inventor is on equal footing with the Edisons, the Wrights, the Bells and the Morses who are continuously creating new things for the comfort, health and happiness of their fellow man.

Most people, however, do not realize that it is now possible to get a patent for a plant; that greater rewards now await those who keep in mind new uses for plants as they stroll in the garden or tramp afield, or nurse some struggling seedlings.

Already the U. S. Patent Office has granted more than two hundred plant patents. A number of the patented plants are on the market. There is the "Gov. Alfred E. Smith Rose," invented by Marguerite Denoyel, of France. Plant patent No. 62 protects this rose. There is no brown derby on it. Plant patent No. 80 is for the rose commercially known as the "Mrs. Franklin D. Roosevelt Rose." There is the "Better Times" rose, quite popular now. It was granted patent No. 23 in the darkest days of the depression. This rose, together with fourteen other varieties of roses, lilies, carnations and azaleas—all patented—recently decorated the banquet table of some 1100 scientists, industrialists and inventors who had gathered in Washington to celebrate the centennial of the modern American patent system. But that was not all. The banqueters dined on turkey served with a delicious dressing prepared from patented pecans.

Patented plants have even invaded the five-and-ten stores. One chain did a rushing business when it sold a patented erect barberry plant whose branches grow vertically instead of in all directions as ordinary barberries do. A large number of inventors, Patent Office records show, have sold or assigned their plant patents to commercial nurseries, where the new variety is assured of development.

A PATENTED REGAL LILY

The General Electric Company developed this flower, which does not scatter its pollen on the pure white petals

Many people will be surprised to learn that Harold L. Ickes, Secretary of the Interior, was among the first plant inventors to receive a patent. It is No. 19, for a "won't fade" dahlia that retains its coral red color, on bush or when cut, until the very end.

Luther Burbank, best known of all plant inventors, received nine plant patents, all posthumously. They are for new kinds of plums, peaches, cherries and roses.

There was agitation for plant patents as early as 1868. Before Congress passed the plant patent bill on May 23, 1930, plant breeders who created new plants had no protection, no way of preventing others from appropriating their discoveries, nor of receiving royalties for their creative labors as did inventors of mechanical devices, for example.

There is the case of Paul Stark who had to protect his "Golden Delicious" apple tree in an iron cage to keep persons from stealing shoots for grafting. Now the plant inventor can get a patent, sue those who pirate his plant, and reap benefits in the form of royalties for the 17-year life of his patent.

Thomas A. Edison was very much in favor of a plant patent law. He thought that its passage would produce many new "Burbanks." Edison, himself, had turned to plant inventing. When he died he was working on a goldenrod that would produce rubber.

The law, however, does not authorize the granting of patents for all classes of plants. It provides that a patent may be obtained by any person "who has invented or discovered and asexually reproduced any distinct and new

AN ALMOST BLACK ROSE

It is a deep violet, appearing black at a distance. The patent, granted to the Conard-Pyle Company, minutely describes the whole plant

variety of plant, other than a tuber-propagated plant . . ." New kinds of Irish potatoes or Jerusalem artichokes, therefore, cannot be patented. Plants reproduced from seeds, such as wheat, are also excluded. The reason behind this exclusion is that the plants are propagated by the same part of the plant that is sold for food. However, the word "tuber" does not include bulbs, corms, stolons and rhizomes.

To be patentable the plant must be asexually reproduced; that is, by grafting, budding, cuttings, layering, division, or some other form of vegetative reproduction, but not by seeds. Should a Nature lover, or a follower of agriculture or horticulture, out among his rose bushes or strolling in the fields, discover a useful plant, and by careful cultivation asexually reproduce it, he has "invented" a new plant for which he may get a patent. However, a wild, uncultivated variety, the chance find of the plant explorer, apparently is not patentable. But new varieties, produced asexually from it by the plant inventor, may be.

The plant need not be a variety of a new species. It may be a new variety of an existing species. For example, there is plant patent No. 165, owned by the General Electric Co., for the lily that X-rays made. The lily itself is of a well-known existing species, but C. N. Moore, toying with X-rays in the company's laboratories, found that a half-minute dose of X-rays on regal lily bulbs did a strange thing. Lilies grown from the X-rayed bulbs did not dehisce. That is, the anthers did not shed their pollen on the white petals. The lilies' petals, thereby, at no time became discolored, but remained pure and white, a property that florists had long sought. Generation after generation of bulbs from Moore's originally X-rayed bulbs produced lilies that showed this non-dehiscent character.

Great is the variety of plants for which patents have already been granted. There is patent No. 40 for a thornless barberry; No. 45 for an almost thornless rose; No. 143 for a golf-green grass; one for a mushroom; another for a rose that blooms fully in heat and drought when other rose plants lose their leaves and lie bloomless. There are patents for peach, apple, cherry, pecan, orange, grapefruit and poplar trees. There are none, however, for squirtless grapefruits or self-cracking walnuts. There are patents for carnations, freesias, lilies, dahlias, violets, avocados, strawberries, blackberries, raspberries, sugar cane, an almost black rose, a giant pansy with stems two and a half to four feet high and flowers three to four inches in diameter, giant grapes, an orange that looks like a lemon.

But the rose patents, more than one hundred, are most numerous. They differ in color, fragrance, form, resistance to heat, cold, drought, disease, shape of petal, bloom, productivity. These are some of the characteristics that may make for new varieties of plants, and should be watched for by the plant inventor.

It costs $30 to file an application for a plant patent, and another $30 when the patent is granted. The Patent Office requires copies of the application and drawings to be filed in duplicate. The duplicate is sent to experts in the U. S. Department of Agriculture for consideration as to the validity of the claim.

At times plant inventors find it most difficult to define the distinguishing features of plants. Suppose the new violet differs from other violets only in having a new fragrance; a new apple from others in taste. No one has yet successfully defined odor or taste. Just try to define the perfume of violets. In such cases the inventor may be required to submit a sample of his plant to the experts.

A NEWLY-PATENTED CARNATION

Developed by Thomas L. Knipe, this flower has petals edged with a delicate rosy magenta. It blooms more freely than the average carnation

Where color is the distinctive feature of a new variety of plant, drawings or photographs must be in color. Some of the most perfect colored photographs of flowers exist in the patented files of the 208 plant patents already granted. Anyone interested can go to the Office and there inspect the proceedings, files and copies of all the patents granted.

The plant inventor, in perfecting his new plant, often exercises more skill, patience, ingenuity, knowledge and resourcefulness than does the industrial inventor. Unlike the latter, who may accidentally stumble on an invention and see it all in a "flash," the plant inventor may spend many years nursing his seedlings and grafts through generation after generation, before he develops a new variety. Luther Burbank, who would have earned millions had there been a plant patent law during his lifetime, spent nineteen years in perfecting his amaryllis. He grew 65,000 hybrid bushes before he developed his white blackberry.

As yet but one examiner is required to handle all the plant patent applications that are filed. Nevertheless, the pace of plant inventing is gradually accelerating. Plant patent No. 1 was granted on August 18, 1931, to H. F. Bosenburg, New Jersey landscape architect, for a new variety of ever-blooming, clinging rose. This rose found much favor in Germany. Three years later, plant patent No. 100 was issued for a new variety of avocado. And, as this is written, just a little more than five years after the first patent, comes plant patent No. 208.

Here are some plants yet to be invented that should make their inventors rich; an acceptable substitute for the rubber tree; varieties of trees that are resistant to white pine blister rust, the chestnut blight, the "phony" peach disease—ravages that cost the country millions each year.

Stimulated by a law that is intended to reward them for their creations, through patent protection, the plant inventors are going ahead developing new varieties of plants, plants more resistant to cold, drought, heat and disease; roses and lilies, more beautiful to look at, more fragrant; fruits, more delicious and tasty, or better keepers.

Fairy Rings

By L. C. PELTIER

DURING the late summer and fall months one will occasionally come across a curious ring-shaped growth of fungus in the grass of a lawn or pasture. Even at times when the toadstools themselves are not in evidence, these so-called fairy rings can often be seen as a circle of low-growing grass, bordered, particularly on the outer side, by a somewhat ranker growth.

The poets and even the groping scientists of an earlier day explained the rings as being caused by the footsteps of the fairies as they danced together on the grass while the toadstools growing there served as seats when they became tired of dancing. Strangely enough, recent years have witnessed a revival in a belief in fairies.

This circular formation is assumed by a number of different varieties of fungus. A single microscopic spore will suffice, if all conditions are favorable, to develop eventually into a large fairy ring. When a spore falls in a suitable location it germinates and produces threadlike spawn or mycelium. This spreads outward beneath the soil in all directions in search of nutrition. Naturally the nutriment in the center of this mass is soon used up and the mycelium at the center dies from the lack of it. Thus a ring of mycelium is formed in which the outer threads are continually spreading out in search of fresh nutrition while the inner portion starves in the exhausted soil. Thus the ring constantly grows, sometimes becoming very large and attaining an age of several hundred years. The writer saw one instance where large puff balls, ranging in size from six inches to a foot in diameter, formed a huge ring more than one hundred feet across.

Rivalling in interest even the returning bluebird of March, the flying wedges of Canada geese speeding northward to their mysterious summer homes awaken in us vague and unsuspected longings. Whether heard from the farmyard or the crowded city street, the clarion calls of the eager travellers claim our instant attention. As the years go by we mourn their lessening ranks. This small flock, flying in typical formation, was photographed by Raymond S. Deck as it passed over his sanctuary in Connecticut.

The Venus Flytrap in Action

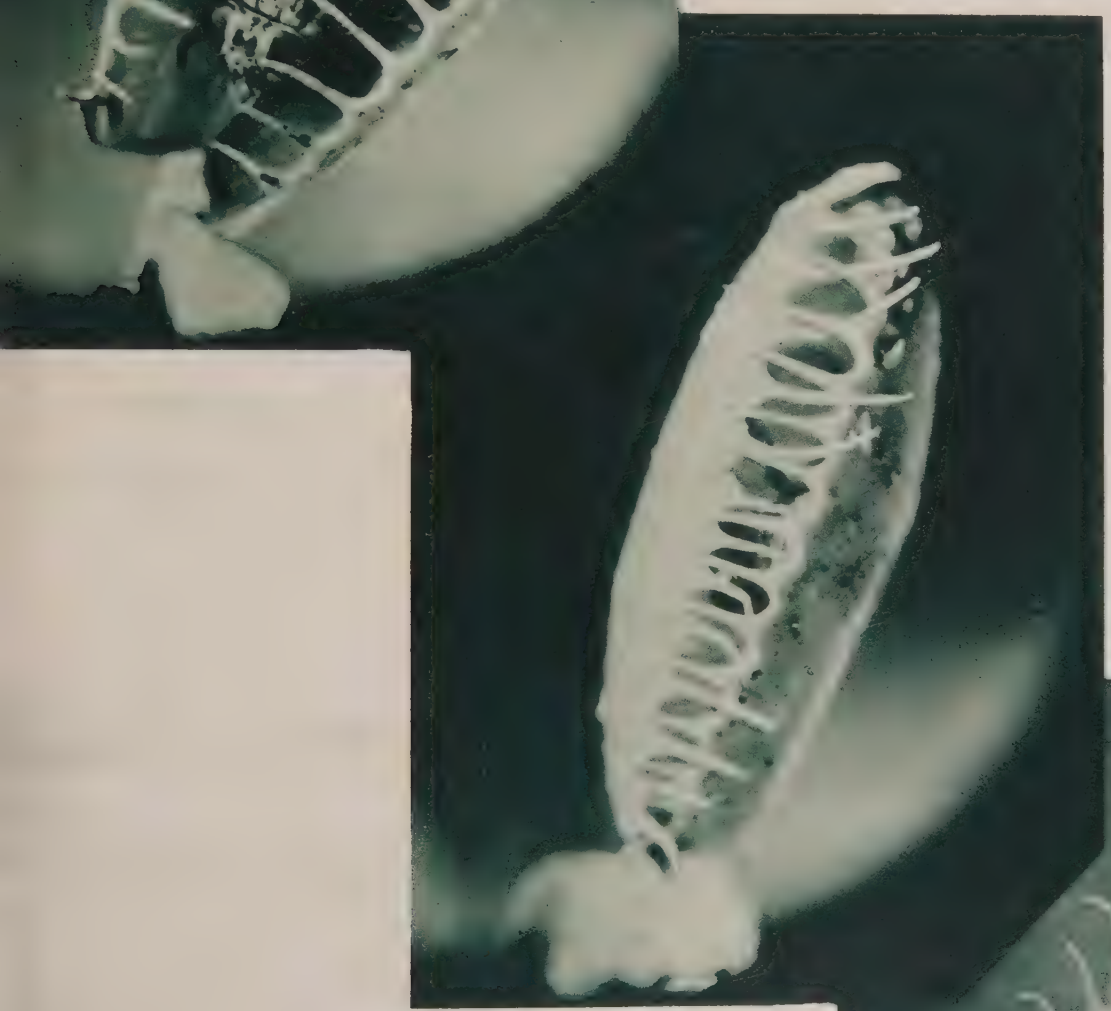
The cannibalistic tendencies of *Dionaea muscipula,* the Venus flytrap, are graphically portrayed in this series of photographs by the Kobel News Service.

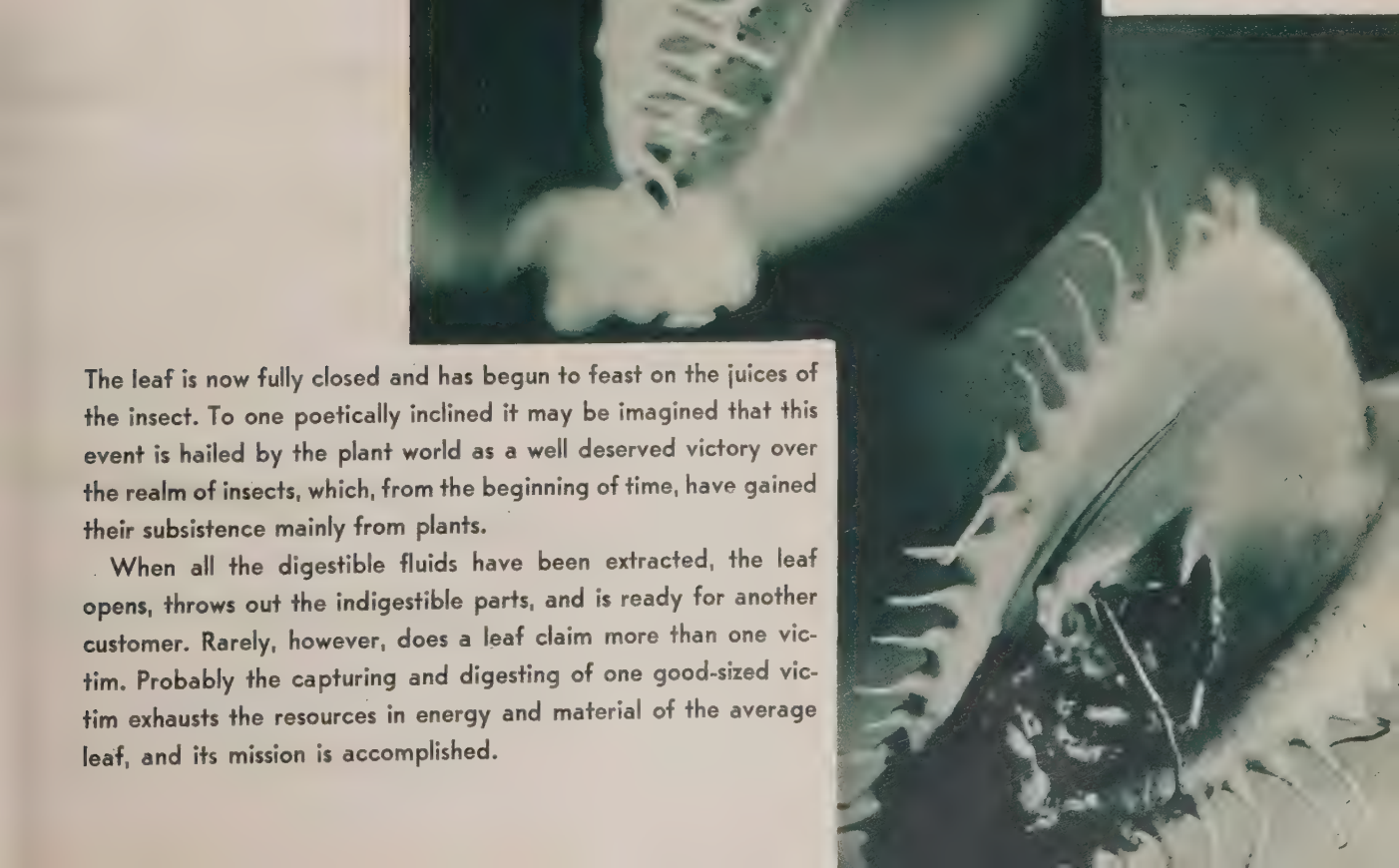
Darwin considered this plant the most wonderful in the world. He used it as a subject for numerous experiments, testing its reactions to the various substances that he used to stimulate it into action, and wrote many pages detailing the results of his patient studies. If the reader will refer to the article on this plant in the July, 1936, issue, a clear impression of the mechanics of the leaf-trap can be obtained.

In the first picture, a fly has alighted on the trap. Here the insect proceeds to investigate the leaf, all unsuspecting regarding the deadly nature of its quest. Close observation has demonstrated that the cilia do not respond to the first touch of the insect. Both plant and insect have plenty of time to allow for any delay that may occur should the fly choose to take a nap in the warm sunshine.

The first slight movements of the leaf do not alarm the insect, and even when the cilia begin to form an arch above it, the fly has no sense of danger. Should it become startled by any abrupt movement, the purpose of the mechanism would be defeated. So the fly has time to advance well into the trap that so cunningly has been set for him.

Too late! The cilia have become enmeshed and escape is impossible. The fly is at last alarmed and attempts to batter his way through the bars of his prison. His struggling only causes the leaf to close more tightly and to release more of the liquid acid that was first excreted when he touched off the trigger hairs. Although it must be nitrogen that the plant obtains from the juices of its victims, it is not absolutely necessary that insects be captured, since this element is provided by the soil in which the plant grows. It is true, however, that the digestive fluid of the leaf is discharged only when it comes in contact with living insects. Glass, wood, paper, water or metals, when touched on the trigger hairs, will not cause the leaf to close.





The leaf is now fully closed and has begun to feast on the juices of the insect. To one poetically inclined it may be imagined that this event is hailed by the plant world as a well deserved victory over the realm of insects, which, from the beginning of time, have gained their subsistence mainly from plants.

When all the digestible fluids have been extracted, the leaf opens, throws out the indigestible parts, and is ready for another customer. Rarely, however, does a leaf claim more than one victim. Probably the capturing and digesting of one good-sized victim exhausts the resources in energy and material of the average leaf, and its mission is accomplished.

In mid-March, 1936, I found these two young great horned owls in the hollowed top of a white oak stub about thirty feet from the ground. They watched with much interest while their picture was being made, and later they became quite friendly. They seemed to enjoy the pieces of chicken that I brought them, and probably welcomed the change from the rabbits that seemed to have been their sole diet.

Large Owls

By M. H. OLDHAM
Fayetteville, Tennessee

This was the owls' last picture, taken four weeks after the first one. They were still as gentle as canary birds, but their claws had become so long and sharp that they made several deep cuts in the writer's hand and arm.

The old horned fellow at the left was no relation to the young owls that I found, but had been raised a captive by a farmer who lived near the edge of the wood where the nest was located. The farmer credited this bird with a mean disposition, but he posed willingly for this picture.

Late in March, 1936, these young barred owls were found in a hollow in an old maple about twenty feet above the ground. As there were no limbs near the nest, three long poles were cut and wired to make a high tripod from which this picture of the nest cavity was made. The young then appeared to be about three weeks old. The light inside the cavity was so poor that for subsequent pictures, made at ten-day intervals, the writer removed them to a perch near the ground. They seemed to enjoy their outings in spite of the fact that their mother heartily disapproved. Fresh food was always present in the nest, mice, rats and rabbits forming the entire menu. At no time was there any evidence that birds had been eaten.

Ten days after the first picture was made the three young barred owls were carried to the foot of their nest tree for this picture. During the process their mother flew about nearby. She would not venture near the nest while the camera was near, so her picture could not be obtained. Twenty days after the first picture was taken, only one young owl was left in the nest. This one was carried down to pose for the last picture while his brothers solemnly looked on from a tree top.

Florida Screech Owls

The adult screech owl in the pine is introduced to show the great contrast in color exhibited by the bird at different ages. When the young first leave the egg they are clothed in white down and rather closely resemble young chickens. Within a couple of weeks and before the young have left the nest, the juvenal plumage, grayish or reddish, comes in and soon replaces the natal down. The young leave the shelter of the nest and spend the daytime hours not far away, still attended and fed by their parents. Late in summer the juvenal plumage gives way to the grayish or reddish plumage of the adult, for this species has two distinct color phases.

These pictures of screech owls were taken by Wray H. Nicholson, Nature photographer, of Orlando, Florida.

Some American Insect Galls

Photographs by L. W. Brownell

All of us have seen the curious growths on plants called galls that result from the activities of insects and their allies. Most of them start from the placing of eggs in the plant tissue. Oak "apples" are common examples. In some unexplained manner, the disturbance gives rise to an abnormal growth of rather definite form in which the young insect passes its early stage of life, generally subsisting on the plant tissue. Ordinarily, the plant is not injured.

Galls are of almost infinite variety, and are classified and given names in much the same way as are true species that produce their own kind. They are named in accordance with the species of insect that produce them.

Although Nature has permitted the formation of galls solely for the benefit of their makers, man sometimes appropriates them for his own use. For centuries a Eurasian gall has been widely used in making ink; other kinds rich in tannic acid have been used as food for livestock, even in this country, and a few even as food for man.

The pine cone willow gall, *Rhabdophaga strobiloides,* which results from the work of a gall midge, occurs on willows in many parts of North America. Many believe such malformed willows to be a distinct species that bears a rose-like blossom, and call the plants "rose willows." Often it is difficult to convince such people that the "rose" results from the egg-laying of a tiny fly.

The maple spot gall, *Cecidomyia ocellaris,* yellow with fuzzy red margins, so common on the leaves of the soft maple, is caused by a gall midge.

The blackberry knot gall, *Diastrophus nebulosus,* caused by a gall wasp, is common on the stems of our high-bush blackberries. Its general appearance is shown in the illustration; its color is dark green, turning to reddish. From one of these galls there may emerge dozens of tiny flies.

Everyone has seen the prickly globes of the spiny rose gall, *Rhodites bicolor,* ornamenting the twigs of our own garden roses. The yellowish or reddish ornaments are also caused by a species of gall wasp.

Oak bullet-galls, *Disholcaspis globulus,* yellowish or reddish in color when fresh, turns to a dull brown when they become dry in autumn. They appear, singly or in bunches, on the twigs of many of our oaks.

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The horned oak-gall, *Andricus cornigerus,* occurs rather commonly on scrub oak and several of the larger species of the black oak type. It is caused by a gall wasp and sometimes occurs in groups of fifty or a hundred.

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The hickory peach gall, *Caromyia persecoides,* results from the egg-laying of a gall midge.

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The ash midrib gall, *Contarinia canadensis.* This elongated tumid gall comes from the work of a gall midge.

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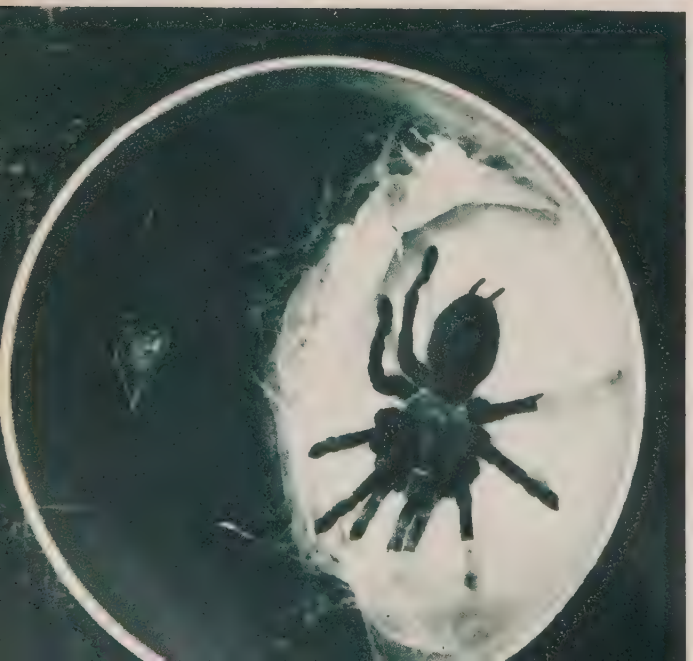


The Tarantula Builds Her Egg-Sac

Photographically recorded by Lee Passmore

This interesting series of photographs on this and the next page reveal the tireless working of the western tarantula, ***Eurypelma californica,*** as she constructed the sac for her eggs in the bottom of a tin box. The first picture shows the spider entirely surrounded by a filmy sheet of webbing that had taken her three and one-half hours to spin. Up to this time no attempt had been made to photograph the tarantula lest she be disturbed in her operations. When her work was well started, however, an exposure was made, and it was found that she paid little or no attention to the picture-making. Many layers of webbing were required to form the base upon which she laid her eggs a few hours later. The spider could be seen quite plainly during the earlier stages of the construction, as the ceiling of the web was not thick enough to hide her operations. She worked almost continuously, adding layer after layer of silky strands over the base, sides and top. At times she stood on her front legs, with her abdomen raised as high as it would reach, and her spinnerets pressed against the underside of the roof of the enclosure. It is believed that the mother surrounds herself with this webbing before she lays her eggs to insure their protection from parasites.

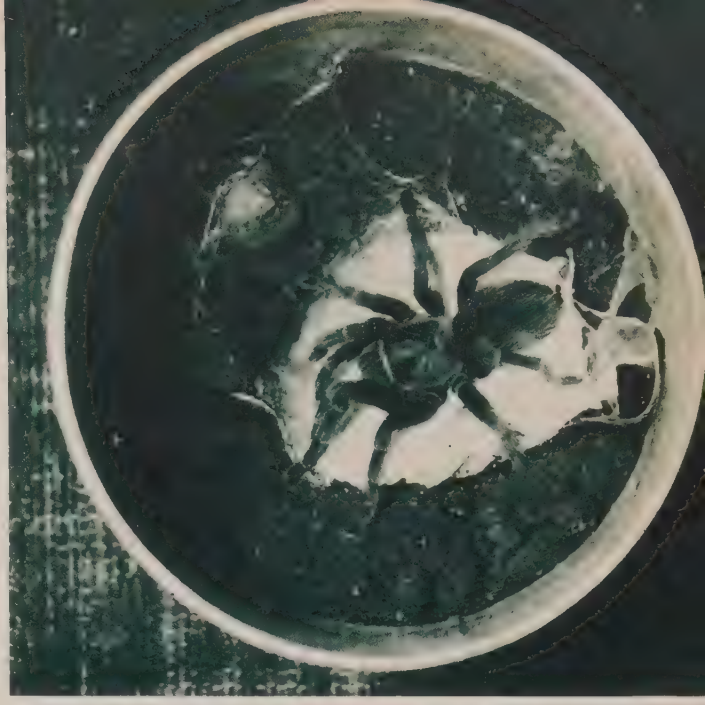
The spinning of the enclosure was almost completed when the second picture was taken. By peering through the thinnest place that could be found in the ceiling, it was seen that the tarantula was ready to deposit her eggs. A depression that had been made in the earthen floor for the purpose of holding water for the spider formed a cup-shaped receptacle large enough to hold the eggs. Twenty-five minutes after the process began, the tarantula had laid all her eggs.

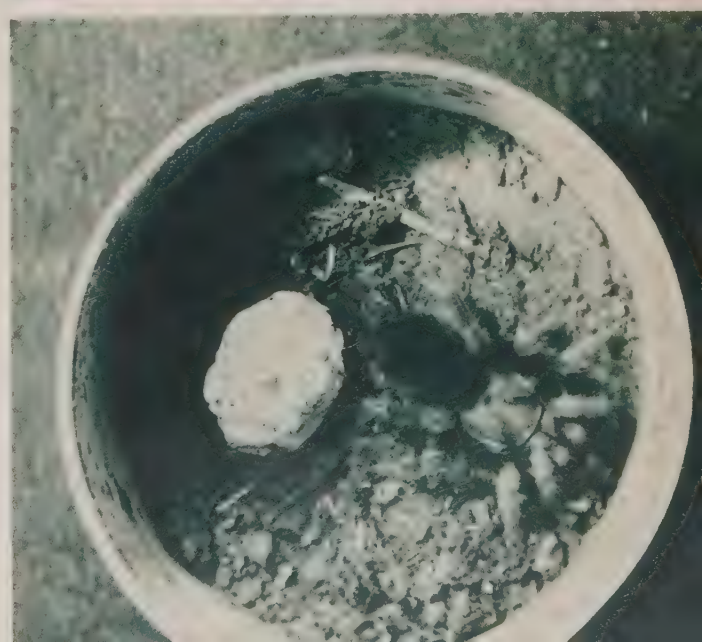
She immediately began covering them with webbing, not stopping to rest until she had worked industriously for two hours. She seemed quite exhausted at

this time. The eggs were about the size of pearl barley and yellowish in color. It was necessary that I keep my eyes close to the web in order to view the spider as she went about her labors within the enclosure. My breath, striking the filmy canopy, caused it to move perceptibly, and this interruption stopped her spinning for several minutes. To overcome this difficulty a sheet of glass was placed over the web. From then on the spider never ceased her spinning until the eggs were covered with a thick layer of webbing that completely concealed them.

When the eggs were completely covered, it was decided to cut away some of the ceiling to permit a clear view of the spider. A sharp pair of scissors was used for this purpose, and the tarantula seemed not to notice that the web had been disturbed. Soon afterward, she began to tear the webbing from the walls of her cell, using her front feet and sometimes her fangs. The webbing was gathered under her feet and spread out evenly over the web that covered her eggs. More silk was added to the thin layers that had formed the canopy, but it was now used for the purpose of completing the egg-sac. In the first picture on this page she is shown adding more webbing to the entire mass. The edges were drawn in from time to time, being held in position by successive layers of silk. The spinnerets are shown here as they moved from left to right between the two hind legs of the spinner. In this photograph the reduced size of the abdomen is clearly shown as compared with the first one of our series.

At the time the fifth picture was taken, practically all of the webbing had been used to cover the mass of watery eggs. Only small portions of it remained clinging to the walls of the cell. The spider kept rolling the egg-sac over and over, never allowing it to rest for more than a few moments at a time. This was done, no doubt, for the purpose of separating the eggs within the sac while the shells were hardening, and she continued to move the sac about for three or four days. At the end of the fourth day the tarantula left the sac at intervals, apparently to rest at one side of her prison. This gave an opportunity to take the last picture, which shows the rounded sac as it appeared when completed.

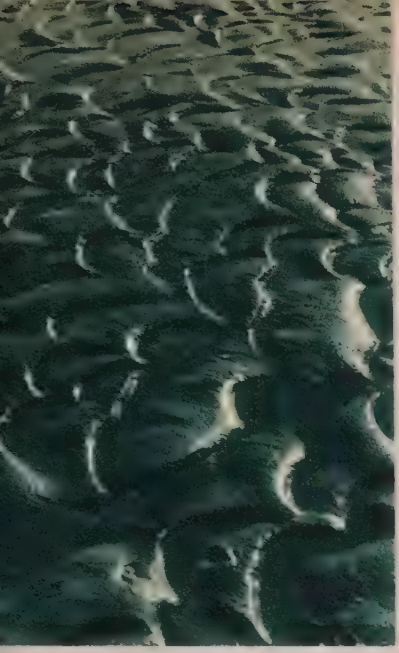




NO MAN'S LAND

Photographs by Alfred Ehrhardt

Between the low-lying Netherlands and German coasts and the Frisian Islands that guard them from the North Sea is a typical "no man's land" of a type found nowhere else in the world. At low tide there appears an expanse of sand and mud called the "watt," interwoven by river-like channels known as the "priele." At such times pedestrians and horse-drawn carts can pass between the mainland and the neighboring islands, but high tide brings a boisterous sea that covers the watt to a depth that allows the passage of shipping of all kinds. In the changing process, storms, wind, currents and this enormous tide combine to carve on the ocean floor many varied and fanciful designs, a number of which are shown here. At the left a shoal of eels seem to be wriggling their way past the camera lens, but these are only longitudinal ripple marks left by the last receding tide. The other designs resemble a system of pipes for some gigantic public works project, the fossilized vertebrae of some prehistoric monster and a catch of herring lined up on the beach. This latter formation was caused by two currents, one washing across at right angles to the first. Strange, indeed, are the ways of the waters.



In the bared ocean bottom designs note the resemblance to agitated water, fossil plant leaves, and an airplane view of a coastal landscape. Below is an example of the beautiful cloud formations often found above the expanse of the watt. In the last picture five natives walk safely on the bared ocean floor between the mainland and the island of Neuwerk. Their only care is that they get across before the next high tide comes rushing in.

THE ARAPAHO GLACIER

By RONALD L. IVES

Nearly two and one-half miles above sea level, on the eastern slope of the Front Range of the Rocky Mountains fifty miles northwest of Denver, Colorado, are situated a number of glaciers, of which the Arapaho is the largest and best known. The photograph above shows the glacier as viewed from Glacier Lake, ten miles east of the ice field. The long ridge in the middle distance is the moraine built up by the glacier during its last advance some 20,000 years ago. Below we see a close-up of the same general area taken in the spring. At the left is Arapaho Glacier, in the center is Henderson Glacier and at the left is Ice Lake Valley, once occupied by a glacier. Accessible by road and trail from Denver, Boulder and Lyons, the glaciers attract tourists

and scientific parties throughout the short mountain summer. The roads to the region begin in the well-watered valleys at the junction of the mountain and the plains area, rising gradually to the forest-covered peneplain at 9000 feet. A few thousand feet higher, just beyond the end of the road, is the beautiful timberline zone where the trees become dwarfed and distorted from the short growing season and the fierce winter winds.

Above timberline, and often within a few feet of the ice, grow the multi-colored and fragrant alpine flowers, gentians, bluebells, pentstemons, forget-me-nots and mountain columbines. Such plants and the hardy dwarfed shrubs and grasses furnish food for marmots and conies that make their homes in the rock slides and boulder fields from timberline to the highest summits. The glaciers, occupying the heads of the valleys, receive snow from the winter storms, and this is transformed to rivers of ice that flow slowly down the valley until the forward motion is checked by melting. Here, the rocks and gravel torn from the valley floor are dropped, and the accumulated material forms a ridge that is called a terminal moraine. The Arapaho Glacier has been grinding away for many hundreds of years and the debris seen in the foreground of the above picture is the moraine that has been built up.

The ice of the Arapaho Glacier has been found to move forward at an average rate of twenty-seven feet a year. A series of years with lower temperatures and increased snowfall causes the glacier to advance farther than usual; a series of warmer seasons causes it to melt away. At least three times in the past the Arapaho

Glacier has extended eight miles or more down the valley. The boulder pictured above, which fell upon the glacier from the valley wall during the winter, was supported three feet above the surface of the ice by snow. When the supporting snow melted, the rock fell into the ice. The last photograph, taken from South Arapaho Peak, 13,600 feet high, reveals a panorama of the glacier 1600 feet below. It shows a square mile of slowly moving ice at the lower left, the moraine in the center, and the numerous lakes carved out by former advances of the glacier in the upper right. Will it, in the future, advance again, filling the valley it once occupied, or is it retreating now for the last time, to melt away and never return? Scientists are studying this glacier, as well as others in the Rocky Mountains, in an attempt to answer these questions about glacial habits.

★ Conservation ★

A section of Nature Magazine devoted each month to the expression of practical opinions on the vital issues affecting our use and abuse of natural resources, including wildlife, and dedicated to the purpose of assisting Americans to play a militant part in the attainment of constructive conservation aims.

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THE MAN ★ ★ FOR THE JOB

Once upon a time a manufacturer of automobiles decided to make a radical change in the construction of his engine. It was revolutionary, and he had to have a man to head the department carrying on this important work. So at his club he talked to some of his friends—doctors, lawyers, bankers—whose opinions carried weight with him. They suggested some names of successful men. One of these he asked to come to head this new department. This man was head of a large and successful dairy farm producing tons of milk, butter and cheese. He was a success, important and had lots of influential friends. He didn't know a piston from a spark plug. And so . . .

Yes, of course, it's a fairy tale. The manufacturer of automobiles wouldn't be such a fool, or, if he were, he wouldn't be making automobiles long. But when we look at the record we find that in our curious business of politics and government such things can and do happen. Men who are successes, important and have lots of influential friends turn up in the strangest positions of responsibility, about which they know little more than did the farmer about pistons and spark plugs.

There are, of course, many appointments in governmental jobs—both state and national—that are purely political and accepted as such. The selection of an untrained politician as the titular head, in such cases, does no particular harm. Trained underlings do the work. But in many other cases such a practice *does* do harm, and this is particularly true when the individual appointee is given the authority to use, or abuse, a natural resource.

Most of our states, for example, have commissions, known variously as conservation commissions, fish and game commissions or development commissions. In many cases the man, or small group of men, chosen to direct the activities of the commission are political appointees. Fortunately most of them have trained foresters on their staffs to handle forestry matters, and some have trained biologists competent to advise on wildlife matters. But the commissioners have the final say. If a sanctuary is to be opened to shooting, a forest cut, a recreational area set up in some place that should remain wild, they can do it. And, naturally, they respond to political pressure in all such cases. The natural resources in their care are handled according to the dictates of organized minorities waving a fistful of votes or dollar bills for license fees.

The Federal Government is not infrequently similarly afflicted. No cabinet member, of course, could be expected to exercise more than a general executive control over the far-flung functions of his department. But it is important that the men and women entrusted with the many specialized bureaus, offices and divisions be thoroughly trained in their fields. In most instances this is the case, but there are some glaring exceptions that serve to illustrate the importance of the proper man for the job.

We have had some definite things to say in these pages about the manner in which the affairs of certain bureaus have been handled. We may have occasion to discuss further such matters, if we believe that the property of the people is being mishandled.

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A LIGHT IN ★ THE DARKNESS

For the first time in history, the importance of the conservation of the nation's natural resources has gained such attention that a bill providing for governmental cooperation with the States in promoting conservation education in public elementary schools, high schools, colleges and universities, has been introduced in Congress. Senator Royal S. Copeland, of New York, author of the proposed legislation, has written into his bill (S.682) provisions for the appropriation of money to be used in preparing teachers, supervisors and directors

of conservation subjects, and the payment of their salaries. As it now stands, the measure is deserving of the support of conservationists throughout the country.

Appropriations upwards of a million dollars are authorized the first year, with increased amounts the following years, and the conditions under which the money shall be spent are specified. General supervision of the program would rest with the Federal Office of Education.

The bill further provides that conservation courses in public colleges and universities shall be so arranged that the students will be prepared not only for teaching positions but also for conservation positions with the State or National Government. The measure has been referred to the Senate Committee on Education and Labor.

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THERE IS STILL TIME

The finest examples of sugar pines in the world—those of the Yosemite Valley, California—will be logged out, beginning the first of March, if congressional action is not taken at once. These giant trees are no less worthy to be saved than were the huge Sequoias that stand not far from them but which, happily, are growing within the boundaries of Yosemite National Park. The Emergency Conservation Committee of New York has actively campaigned to save these trees from destruction, and this campaign has had the approval of the President, the Secretary of the Interior, the Director of the Park Service and the Superintendent of Yosemite National Park. The American Nature Association joins with the E. C. C. in urging all interested persons and organizations to write their Senators, Representatives and the President requesting that a bill to save them be introduced and passed before these historic landmarks are destroyed. The only method seems to be the purchase and addition to the Park of the area bearing these great trees. Copies of all letters should be sent to Harold L. Ickes, Secretary of the Interior, Washington, D. C.

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DEPARTMENT OF CONSERVATION

President Roosevelt has sent to the Congress the report of his Committee on Administrative Management proposing sweeping government reorganization. The President placed his cachet upon this report and its recommendations. It was received by Congress, and by the public generally, with mingled emotions, presaging, as it should, much discussion and legislative battling, before it is translated into law.

That part of the report which concerns us relates to conservation. On this the recommendations are both brief and general. Specifically the program would create three new departments—Conservation, Social Welfare and Public Works—and abolish one—Interior. The Department of Conservation would "advise the President with regard to the protection and use of the natural resources of the Nation and the public domain." Further this Department would "administer the public lands, parks, territories, and reservations, and enforce the conservation laws with regard to public lands and mineral and water resources, except as otherwise assigned."

Actually, of course, what this means is that the name of the present Department of the Interior would be changed to Department of Conservation, a consummation actively sought by Mr. Ickes during the last Congress. Some of its present functions would be transferred elsewhere; more would be added. The report, however, does not go into any detail, so we must await specific proposed legislation designed to carry the general ideas of the plan into effect.

One thing, nevertheless, is plain and worthy of comment at this time. This is that the administration and conservation of both our renewable and non-renewable natural resources would be lumped together. In the plan for recasting the conservation functions of the government, proposed by the American Nature Association a year ago, we particularly urged that conservation of renewable natural resources be administered as an entity. We still believe this to be the wiser policy. The philosophy of managing renewable resources differs radically from that applicable to non-renewable resources. They are better kept apart.

Our proposal contemplated a Director of Conservation under an Assistant Secretary of Agriculture for Conservation. (See NATURE MAGAZINE, March, 1936.) It was, and still is, our conviction that, with the exception of the National Park Service, the conservation record of the Department of the Interior left much to be desired. At the same time we are for anything that will achieve a coordinated and effective program of conservation of renewable natural resources. It is conceivable that certain activities now in the Department of Agriculture might exert a beneficial influence on other bureaus with which they would become more intimately associated through reorganization.

It is difficult at this time, for lack of specific proposals, to weigh the value of the proposed government revision from the conservation viewpoint. We must, therefore, await with active interest legislation that will soon be introduced by the joint congressional committee designated to draft and introduce bills.

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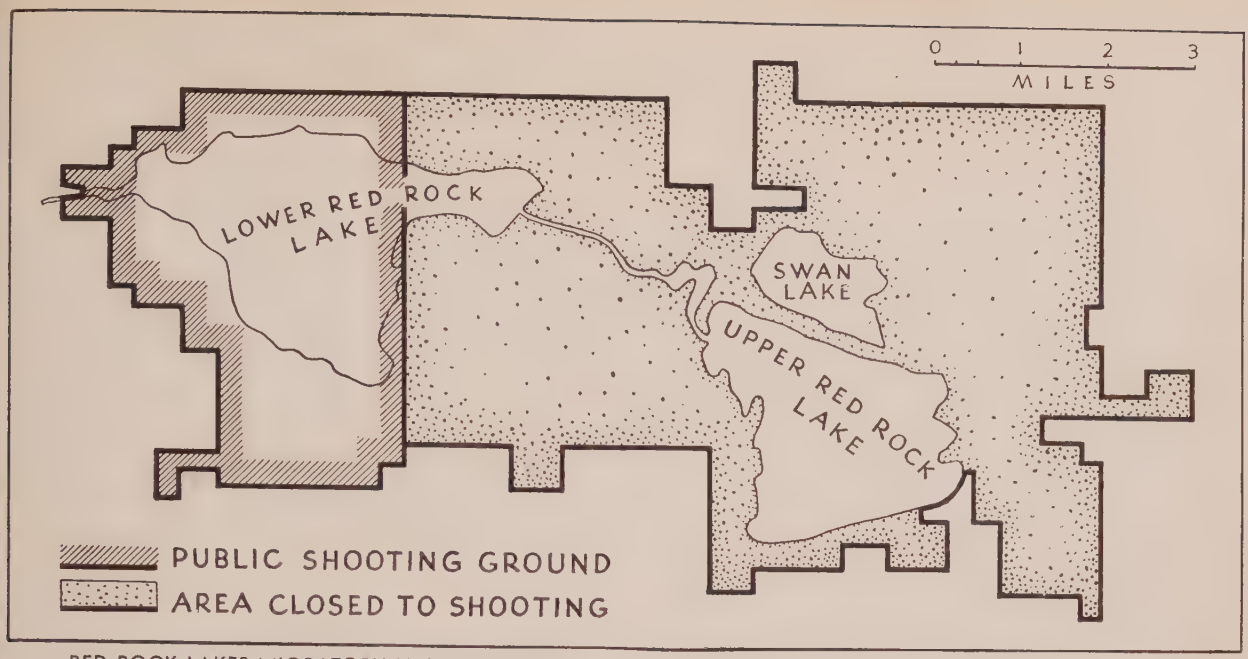


RED ROCK LAKES MIGRATORY BIRD REFUGE, IN SOUTHWESTERN MONTANA, WAS ESTABLISHED AND WIDELY PUBLICIZED AS AN OUTSTANDING REFUGE IN 1935. BUT IN 1936 PART OF IT WAS A SHOOTING GROUND

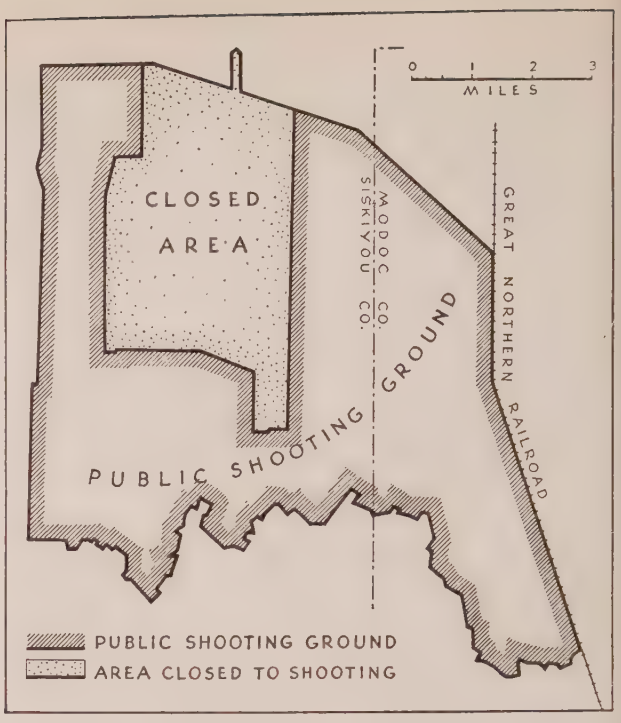
Shooting Grounds on Bird Refuges

The establishment of Shooting Grounds on Federal Refuges, while America's ducks and geese are dwindling, must vitiate the restoration program

On February 18, 1929, after nearly eight years' effort on the part of conservationists and sportsmen to pass a game-refuge bill that had as an essential feature shooting grounds associated with refuges, the law popularly known as the Norbeck-Andresen Migratory Bird Refuge Act was passed by the Congress, and was signed by President Coolidge. It differed essentially from the bills from which it developed in that refuges established under its provisions must be inviolate, and it authorized the use of several millions of dollars to be appropriated through a series of years. Conservationists hailed this Act with enthusiasm, for it seemed to promise the establishment of many worth-while sanctuaries for waterfowl and other wildlife.

The first appropriation, upwards of $75,000, was made available on July 1, 1929. During the first fiscal year work under its provisions was vigorously prosecuted by the Biological Survey and a report was rendered by the Commission responsible for approving this work. For the fiscal year 1931, $200,000 more was appropriated, and further satisfactory progress was recorded. Although no appropriations for inviolate sanctuaries for waterfowl appear to have been made since 1931, several millions of dollars in the aggregate have since been made available from other sources for the establishment of refuges for waterfowl and other wildlife. In the expenditure of these sums, including monies that have been spent on relief projects, including CCC and similar activities, it appears to be left to the discretion of the Secretary of Agriculture whether or not the resulting reservations shall be sanctuaries. And to many there now comes as a distinct shock the realization that on several of these so-called refuges there are established shooting grounds, with elaborate provision for the convenience of the patrons, including guides and boats. Shooting grounds on waterfowl refuges are not altogether new, for several have been in operation on refuges during past years, usually on minor areas. But at no period in the progress of waterfowl exploitation has the establishment of shooting grounds on refuges assumed the sinister importance that attaches to it at the present time, when the fact that waterfowl are alarmingly diminished is admitted by conservationists and destroyers alike.

First, let us consider Red Rock Lakes Migratory Waterfowl Refuge, situated in southwestern Montana. This was established by Executive Order No. 7023 on April 22, 1935, "in order to effectuate further the purpose of the Migratory Bird Conservation Act (45 Stat. 1222), * * * set apart for the use of the Department of Agriculture as a refuge and breeding ground for wild birds and animals". It originally contained 22,862.96 acres. It was enlarged by Executive Order No. 7172 on September 4, 1935, and then aggregated about 37,000 acres. It is one of those refuges that were established on waterfowl migratory flyways, and, partly on the strength of this fact, and because it included the breeding ground



TULE LAKE WAS FORMERLY IN REALITY A LARGE LAKE BORDERED BY MARSHES, IDEAL BREEDING GROUNDS. THESE HAVE BEEN ALL BUT RUINED BY DRAINAGE AND GRAZING. THE "REFUGE" NOW SEEMS TO BE MOST VALUABLE AS A SHOOTING GROUND

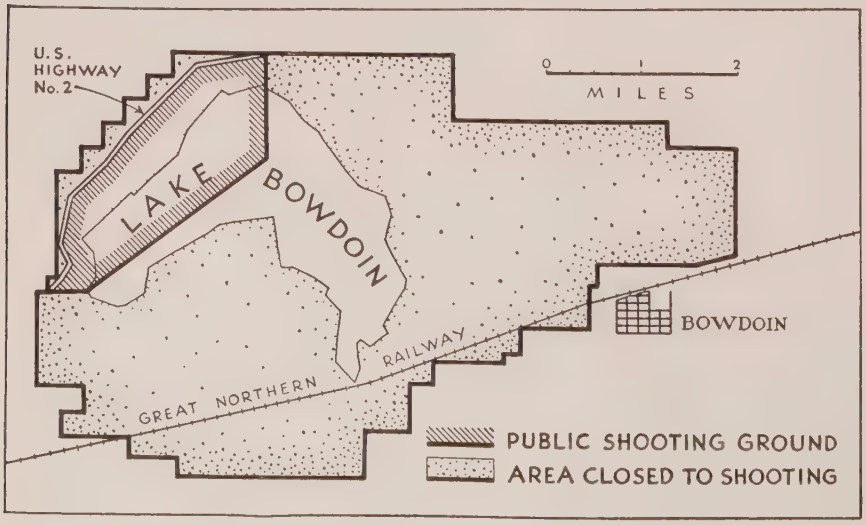
of a few of the sore-threatened trumpeter swans, its acquisition was lauded as an important step in waterfowl restoration. So outstanding were the claims advanced for its efficacy that it is safe to assert that not one conservationist in a thousand suspected that shooting would ever be permitted within its borders.

In the *Federal Register,* issue of October 9, 1936, appears the first public notice of shooting grounds on the Red Rock Refuge. It contains the text of Executive Order No. 2200, "Regulation designating as closed area under the Migratory Bird Treaty Act certain lands and waters adjacent to and in the vicinity of the Red Rock Lakes Migratory Waterfowl Refuge, Montana." Briefly the order recites that, after consideration of the exigencies in the case it appears that the hunting of waterfowl on the area designated "area closed to hunting" would be incompatible with the terms of the Act, and that the establishment of this closed area will tend to effectuate the purposes of the Migratory Bird Convention and the Migratory Bird Treaty Act.

On subsequent pages of the same issue is printed the "Order Permitting and Regulating the Hunting of Migratory Waterfowl and Coots Within Designated Area of the Red Rock Lakes Migratory Waterfowl Refuge, Montana". This permits shooting of species not protected by other regulations from October 10, 1936, to November 8, 1936, within the area designated "Public Shooting Ground". The order is accompanied by a diagram showing the areas closed and open to shooting. The map that we reproduce here is copied from this diagram without essential change.

The cases of the other refuges here discussed differ in some particulars from Red Rock Lakes. Tule Lake, formerly called Rhett Lake, and being partly in Oregon, used to be a large lake, deep in places, but bordered on its northern and eastern shores by extensive marshes. In the late nineties these marshes were a breeding place for hordes of water birds, including many herons and grebes, whose colonies were ravaged by the plumage hunters. It was also a favorite resort for the market shooter and through the years it has suffered much from drainage and exploitation of various kinds. As a lake it has long been hardly existent, but enough marsh remained to warrant its establishment as a bird refuge in 1928. For several years it has been in part a shooting ground, but for some reason, perhaps a change in boundaries, this fact seemed worthy of confirmation, and the map here shown is copied, without essential change, from a diagram accompanying an order signed by the Acting Secretary of Agriculture on October 30, 1936. (*Federal Register,* Doc. No. 3174.) It was on this refuge that more than 3200 wounded birds were recovered by the warden in the shooting season of 1931. The total number thus crippled and the proportion to those killed was not ascertained. (See *Nature Magazine,* November, 1932, p. 244.)

Lake Bowdoin Migratory Waterfowl Refuge, in northern Montana, seems to be in a class by itself. It was



LAKE BOWDOIN MIGRATORY WATERFOWL REFUGE. THIS IS ONE OF THE FEW REFUGES IN MONTANA. A SHOOTING GROUND BESIDE THE HIGHWAY MAKES IT ALMOST IDEAL FROM THE STANDPOINT OF THE DUCK HUNTER.

IN THE APRIL ISSUE WILL BE SHOWN A FEW OF ITS NESTING BIRDS

established by Executive Order No. 7295 on February 14, 1936, and from the start was equipped with shooting grounds. The text of the first part of this order is here quoted:

"By virtue of and pursuant to the authority vested in me as President of the United States, and in order to effectuate further the purposes of the Migratory Bird Conservation Act (45 Stat. 1222), it is hereby ordered (1) that all the following described public lands, surveyed or unsurveyed, be, and they are hereby, reserved and set apart for the use of the Department of Agriculture as a refuge and breeding ground for migratory birds and other wildlife; and (2) that such part of such lands as the Secretary of Agriculture may deem proper be reserved for use as a shooting area to be operated under a cooperative agreement or lease with the Montana State Game Commission or such other operating agency as may be approved, and under such regulations as may from time to time be adopted by the Secretary of Agriculture."

We cannot understand the significance of the reference to the Migratory Bird Conservation Act (45 Stat. 1222). This is the act of February 18, 1929, which was designed to establish *inviolate* refuges. It is true that we have not sought legal advice, or even searched the record to ascertain whether any quietly adopted amendment modifying the original intent has become law since 1929. But, whether this action be lawful or otherwise, we have no hesitation in affirming our belief that such establishment of shooting grounds on the few relatively small refuges that the Biological Survey has been able to establish severely handicaps its program of restoration.

We have no reason to think that the idea of having shooting grounds on these or any other refuges originated with the Biological Survey. It is manifestly a hang-over from the old shooting-grounds bills which, after years of effort, went down to defeat in 1929. To the type of "conservationist" who has never become reconciled to inviolate sanctuaries there is no use to establish refuges where waterfowl, weary and hungry from their long flight, may rest and feed, unless he may be permitted to slaughter some of them. It is all too evident that the wishes of such men have influenced these regulations. The cases here cited by no means exhaust the list. There is Mattamuskeet Refuge in North Carolina, where two shooting grounds, distinguished by names, have been in operation for years; there are several others.

The Secretary of Agriculture, any Secretary, is necessarily given broad powers in the formulation and adoption of measures. Since he is charged with the duty of administering an act designed to protect and perpetuate an important national resource, the powers delegated to him *must* be broad. But we believe that it is the duty of all persons, high and low, in administrative circles, to resist demands made upon them to grant privileges that endanger the resource they have in charge. We believe, further, that there is grave danger that the practice of establishing shooting grounds on refuges, if continued, will seriously vitiate any conservation program. How are conservationists to know what day they may awaken to find shooting on Lake Malheur, Salton Sea, or Blackwater? For all we know, these, and many others, may now be ear-marked for sport shooting.

CONGRESS AND CONSERVATION

THE HOUSE COMMITTEE on Conservation of Wildlife Resources, investigating matters pertaining to the replacement and conservation of wildlife, has submitted its report to the new Congress. The committee, after hearing representatives from the Biological Survey, the Bureau of Fisheries, the Forest Service and the Park Service, has made the following recommendations:

1. Increased activity toward the better control of pollution of streams and navigable waters. Testimony before the committee revealed that the sewage of approximately eighty-five percent of the population is untreated, and that pollution forms a major limitation on the maintenance of an adequate supply of food fishes in interior waters.

2. Continuance of Civilian Conservation Corps work. A Biological Survey witness testified that with the present number of CCC camps a 5-year program must be contemplated.

3. Special attention should be given the conservation and restoration of fur bearers. The committee found that this natural resource is rapidly diminishing "and steps should be taken immediately toward restoration and preservation," and that this tremendous industry has rapidly declined to one of comparatively minor importance "because of overtrapping and lack of constructive game management." Dr. Ira N. Gabrielson, chief of the Biological Survey told the committee that the present situation "is due to the public's extreme indifference to fur conservation. . . . There seems to be no policy of live and let live where fur animals are concerned."

4. Congress should take appropriate steps to meet the need for a fisheries research vessel authorized by law in 1934. No action has been taken to supply this pressing need of the Bureau of Fisheries.

5. The Bureau of Fisheries should be authorized and directed to study the problem of protecting existing fish supplies at hydro-electric, water storage, navigation and flood-control projects. Other recommendations concerned the drafting of bills for treaty regulation of the commercial fisheries of the Great Lakes to prevent ultimate destruction of the industry; the regulation of trawl gear used on the fishing banks frequented by American and Canadian vessels; regulation of the troll fishery for salmon in the North Pacific, the purse seine for salmon on the high seas, and the trawl fishing for so-called shore species off the coast of Virginia and Mary- (Continued on page 178)

STRAW MEN IN THE WILDERNESS

By FRED MORRELL

In earlier issues Nature Magazine has urged the preservation of wilderness areas; deplored the opening up of such areas. Now Mr. Morrell of the United States Forest Service raises some questions about these areas and our attitude, as expressed in September, 1935. We gladly print his views. Discussion is healthful and begets knowledge.

It may be that Mr. Morrell himself is quoting certain sentences from published material and setting up his own "straw men" to tilt at. It may be that he is taking refuge behind the present cloudy official definition of a wilderness area. It may well be that all CCC camps are not working under such competent officials as Mr. Morrell and his associates. But we believe, also, that conservation needs wilderness societies, poets and sentimentalists as antidotes to exploiters and politicians. Sentimentalists are not always right, but neither are practical men concerned alone with facts and figures. Is it not conceivable that the wilderness and all the creatures that dwell therein need a champion to balance the scale in fairness to all?

We print Mr. Morrell's article because it represents one view, well and sincerely expressed. Further, we believe that his article justifies a restatement of the wilderness concept. In the April issue we shall present what we regard as a splendid analysis of this important issue.

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THE SMALL boy decapitating Indians with a tin sword as he rides furiously over the lawn on his wooden horse is as valiant in spirit as the doughboy at the zero hour. It is not what he does, but what is in his mind that thrills him into a frenzy of energy in defense of mother and sister against ravage by the straw men of his imagination.

"Men are but boys grown tall," and grown-ups, like small boys, may frequently be found arrayed for defense against impending evils which are imminent only in their imaginations.

A review of what has been written by wilderness (primitive) area enthusiasts regarding the threat of the Civilian Conservation Corps to their particular hobby in conservation, and a comparison of their statements with what has happened raise fairly the question whether they are in fact defending their cherished areas against a real danger, or whether, being all dressed up for battle, they have, in the absence of real enemies, set up straw men for demolishment.

Some months ago NATURE MAGAZINE editorially advised us that the last ten years "have witnessed the progressive shrinking of many of the few wilderness areas remaining . . . but they have brought to the fore a new threat against the wilderness ideal far greater than all former menaces combined . . . the Civilian Conservation Corps. . . . If not intelligently curtailed, it bids fair to solve the wilderness problem in much the same way the Turks set about solving the Armenian problem—by annihilation." Specifically, the editor tells us that the "Cascade crest in Washington has been literally riddled by roads of the CCC; to the north and west of Mount Adams truck trails have opened up unsurpassable wilderness country; the headwaters of the Selway are invaded by CCC camps; and the Lolo Trail is only a memory. *We have not only conquered the wilderness; we have destroyed it.*" (Italics mine.)

If the CCC had really thus destroyed the wilderness through construction of roads or otherwise, that would indeed be serious. But the facts are that the CCC has not constructed a single mile of road in the designated wilderness area in the Cascades, nor have the 53 miles that have been constructed in the Selway-Bitterroot area destroyed it in the usual sense of the word. What the editor means is that they have destroyed the "wilderness values" and these values, a wilderness enthusiast tells us, "are very delicate. They depend not only on what one can see and hear, but what is in the back of one's mind." Fifty-three miles of narrow mountain roads in an area of 1,870,000 acres would, of course, not affect what a wilderness seeker might see and hear if he were disposed to seek solitude, because he would have no difficulty in keeping away from both sound and sight of the roads—but wilderness enthusiasts seem sometimes to have a trait in common with the lady who filed charges against boys who went swimming in the nude a mile from her home, from which vantage point it was possible to see them through her telescope. It is "what is in the back of one's mind" that counts. And "the mere knowledge that mechanization lies over the top of the hill is enough to destroy some of the finest inspirational values. . . ."

This Selway-Bitterroot wilderness area, in which are 53 of the 66 miles of roads built by the CCC in designated National Forest wilderness areas, contains 1,870,000 acres. Seven hundred eighty fires have occurred in it during the last ten years, 130,000 acres have been burned over. Seven hundred forty-five of the fires were lightning caused. Excepting hunters and fishermen, it is visited by about 170 people per year. It was out of this area, and others then like it in lack of roads and trails, that hundreds of fires unextinguished because men could not reach them, burned together and traveled on to destroy some 85 lives, many homes, and millions of dollars' worth of property in the great Idaho-Montana fires of 1910. It was in this area in part that the great Selway fires which

burned over 280,000 acres, destroyed millions in values and cost hundreds of thousands of dollars to suppress, occurred in 1934. Between those years there were many other fires, large and small, that did great damage to "wilderness values," as most of us would measure them.

Over a period of thirty years the Forest Service did through necessity attempt to control fires in this area through the primitive method of sending men "toting fifty-pound packs over abominable trails" (which we are told is the desirable method of travel in wilderness areas) to find and put them out. The record of 130,000 acres burned in ten of these thirty years is sufficient, from which the reader may gain some idea of the degree of success attained.

There are 68 designated wilderness areas in the National Forests of the country containing a total of 13,197,682 acres—equivalent in size to the combined area of Massachusetts, Connecticut, Rhode Island and New Jersey. The CCC has not riddled these areas with roads. It has in fact built a total of only 66 miles within their boundaries, 53 of which are, as stated above, in the Selway-Bitterroot area. There is no huge army of CCC in the wilderness.

THREE PHOTOGRAPHS OF WILDERNESS VALUES

At the top of the page wilderness values unimpaired; next these values as affected by a road; below, the wilderness as affected by a forest fire. All photographs courtesy of the United States Forest Service

Nowhere in the exposition of the wilderness area idea does one find an advocacy that fires should be allowed to burn. On the contrary, there is consistent demand that they shall not. But one does find objections by wilderness enthusiasts whenever roads are constructed in these areas and much objection to those constructed in other areas by protective agencies for the purpose of fire protection. Invariably this objection seems to be based on an assumption either that the land administrator is insincere in building the road ostensibly for protection when he really intends it for something else, or that he does not know the protection needs as well as does the wilderness advocate, and is, therefore, foolishly and harmfully building the roads.

The CCC has, of course, constructed many miles of roads into areas other than those designated which, under some definition of the term, might well be called "wilderness," but which do not meet the requirements generally set up by wilderness area enthusiasts.

Sixty-eight areas containing a total of 13,197,682 acres, which presumably do meet these requirements as nearly as may be, have been definitely designated in the National Forests. Forest officers estimate that some 50,000 people entered these areas last year for purposes other than hunting and fishing. It may be doubt-

ed whether all, or even any large percentage of these fifty thousand, had such superior appreciation of Nature as to set them apart from many of the millions who traveled into the National Forests by automobile and train, or whether many of them expended great physical energy in their travel. Certainly not more than a very few spent "a few brief weeks as intellectual savages," which we are told is the ideal of wilderness area use. An average of two or three days, subsisting on ready-prepared food, is doubtless nearer the realities. But whatever their use, there is in the designated areas about 220 acres for each visitor and excepting the Selway-Bitterroot area, the CCC might camouflage the roads we have built in these areas so they would not be recognized if we can receive a day's advance notice of when the visitors will be along.

It would be a safe wager that not five per cent of wilderness area visitors travel either by horse or on foot the length of one of the larger areas. Larger numbers and longer journeys are predicted for the future and this, of course, might come to pass. It does seem, however, that 220 acres each for an average of a couple of days leaves much room for expansion in both number and length of wilderness travels.

But the manager of wild lands seemingly cannot make peace with the wilderness enthusiasts on any such factual basis. It is what is in the back of their minds that he must deal with. There can be no generally accepted definition of a wilderness because one enthusiast may get as much thrill and satisfaction in exploring an undeveloped area of a thousand acres as another does from a million acres. Probably not five per cent of those who subscribe to the wilderness area idea have ever been inside of a wilderness that approaches the generally accepted definition, or ever will be. But somewhere they do know of an area that is to them a wilderness. They probably have not explored that one either, but they do not want in it the construction of roads, which changes the physical wilderness very little, but greatly impairs the values that exist in their minds. But neither do they want forest cover destroyed by fire and so have a quarrel with the land manager, whether he builds roads and protects the area, or doesn't build roads and i therefore burns.

The CCC is an organization of young men used in par by long established forest protection agencies to construc improvements designed to reduce the size of the averag annual burn of 40,000,000 acres of wild lands. The CC has not built roads into the immense tracts designated a wilderness areas which include at least ten per cent of th National Forest land usable for recreation, and which be cause of the absence of roads are used by less than two tenths of one per cent of National Forest visitors. It ha constructed some 70,000 miles of truck trails, equivalen to about three miles per township of forest lands in th United States. These roads have of course been built wher roads did not exist before, and have therefore invade what in the minds of some people are wilderness areas Principally they have been constructed to facilitate pro tection. Some of them are to open up areas for recreation Some for administration or transportation of forest pro ducts. Many of them are of value for two or more of these purposes. As a general statement, their justification can not be contested, excepting on the premise that a large percentage of the forest lands of the country should be kept in a burned-over "wilderness" condition.

"There is particular need for a Society now," says one of the Wilderness Society's founders, "because . . . Wilderness remnants are tempting fodder for those administrators who possess an infinite labor supply but a very finite ability to picture the real needs of their country." The CCC does not of course represent an infinite labor supply. It may be possible that some or even all of those directing its work have a very finite ability to picture the real needs of their country. It is more likely that man for man, their ability in that direction compares very favorably with that of the wilderness enthusiasts. And it is possible that there is no CCC army in the wilderness which unless "intelligently curtailed" (by the Wilderness Society) will destroy the values in the back of the beyond. Maybe the terrible Turks are only straw men threatening the wilderness values that depend on what is in the back of the enthusiasts' minds.

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GAME IN NEW JERSEY

A PRESS RELEASE issued by the New Jersey Fish and Game Commission in October makes sad reading for those interested in our native fauna, although "Reports on game conditions in New Jersey forecast a successful upland game season this year with a record number of licensed sportsmen taking to the fields and woods when the season officially opens November 10."

We learn that rabbits are plentiful because of thousands liberated last year. Pheasants and liberated quail are reported doing well. Rails came in great flights. Flights of woodcock were reported. Many broods of partridges (whether ruffed grouse or Hungarian partridges are meant is not clear) have been seen.

Thus New Jersey, with more licensed hunters than ever, must depend largely on imported rabbits, pheasants and foreign grouse, pen-raised quail, and migrant rails and woodcock, and what few ducks and geese may still survive from northern-raised flocks to furnish marks to New Jersey's guns as they hurry along. There are also deer, and in some years New Jersey's barrens yield a considerable number of these gentle creatures.

The wonder is not so much that New Jersey's game should have sunk so low in population, as that the state should still be proud of having sold more shooting licenses than ever before. Therein, we suspect, lies the claim that a "successful" season is forecast.

We fear that New Jersey typifies a condition that is becoming all too common in many of our states.

Things to Think About

THE LONERGAN bill, designed to prevent the pollution of the navigable waters of the United States, which was not acted upon at the last session of Congress, was re-introduced by Senator Augustine Lonergan of Connecticut at this session. The bill, S. 13, would make the National Resources Committee (Exec. order 7065) a permanent establishment of the United States, the committee in turn making such surveys and studies as may be necessary for carrying out corrective measures relating to water pollution. We invite everyone to refer to the article *Do You Want Pure Streams?* in our July, 1936, number, and to urge your respective Senators and Representatives to support this measure.

The House also has before it H.R. 2300, to provide for a survey of the Ohio River and its tributaries with a view to preventing their pollution.

Flood control bills that may affect several regions include S. 206, to provide a preliminary survey of the Snake River and tributaries in the states of Idaho, Washington and Oregon; H.R. 61, authorizing a survey of the Fourche La Fave River, Arkansas; H.R. 117, to improve navigability of the Columbia River, provide reforestation and development in the river basin and effect flood control; H.R. 182, a similar bill relating to the Missouri River valley; H.R. 201, the House companion bill to S. 206; and H.R. 275, to provide for the control of the flood waters of the Wisconsin Valley.

Delegate Anthony J. Dimond of Alaska has introduced several bills that affect, if passed, the wildlife of the Territory. H.R. 1557 provides for the conservation of herring in Alaskan waters; H.R. 1562 would transfer the jurisdiction of all fisheries, except the fur-seal and sea otter fisheries, from the Department of Commerce to the Territory of Alaska; H.R. 1563 would transfer control of game and fur bearing animals from the Department of Agriculture to the Territory.

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The Senate committee on Contingent Expenses has before it a resolution, S. Res. 25, authorizing the Committee on Public Lands and Surveys to continue its investigations on the advisability of establishing certain additional National Parks, and for other purposes. Bills relating to this subject include S. 442, to establish the Shoshone Ice Cave National Park of Idaho; S. 92, to provide for the creation of the Saint Croix National Monument, Maine; H.R. 1495, to acquire additional land for the Acadia National Park, Maine; H.R. 1570, to establish the Mildred Warner-Washington National Monument, Virginia; and H.R. 1964, to construct the Eastern National Park-to-Park Highway through Virginia, North Carolina, Tennessee, Kentucky, West Virginia, and the District of Columbia.

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Representative Wall Doxey of Mississippi has introduced a bill, H.R. 1500, to make the Civilian Conservation Corps a permanent agency of the Government.

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The prevention of soil erosion and floods, and the renewal of forest growth and conservation of water from snow and rainfall in natural reservoirs, is the purpose of a bill, S. 203, introduced by Senator William King of Utah. This measure would direct the Secretary of Agriculture to reforest, revegetate and improve the water-impounding capacities of our national forest lands on watersheds within national forests.

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Representative Wall Doxey also has introduced H.R. 255, a bill to promote sustained-yield forest management in cooperation with the states, in order thereby to stabilize communities, forest industries, employment and taxable forest wealth; to insure a continuous and ample supply of forest products; and to secure the benefits of forests in regulation of water supply and stream flow, prevention of soil erosion, amelioration of climate, and preservation of wildlife. Administration of the proposed act, amending 43 Stat. 653, would be in the hands of the Department of Agriculture.

"The systematic campaign that is being waged against so-called vermin in the sporting and outdoor magazines makes us tired and rather discouraged," says the *Bulletin* of the Eastern Ontario Fish and Game Protective Association. "We realize that the necessity of selling ammunition, and in turn advertising space, is back of most of the editorials and articles we have seen on this subject. Tell your sportsmen and gunners that hawks kill game; that crows destroy eggs and young birds; that owls take rabbits; and you will sell far more ammunition. But why pick on these and call them vermin? We believe, and the biologists will back us up, that the only animals or birds that should be indiscriminately killed are the house rats, stray cats, and the introduced sparrows and starlings. . . .

"The outcry against the crow as a destroyer of duck eggs and young birds is of recent development. Ducks have become scarce, not because the crow takes the eggs and nest-

lings but because the hunters have killed too many. A close season for ducks for the next two or three years would do more to restore the wildfowl than all the advertisements of ammunition companies against the crow could accomplish in the next hundred. Of course, a close season would spoil sales of guns and cartridges and so is out of the question. Make the crow the scapegoat. He has a bad reputation so let him take the blame for the duck shortage. Then our wildfowl can be completely exterminated without embarrassing anyone. . . .

"The latest victims to fall under the ire of the killers are the mergansers. They have been accused of taking too many fish. Uninformed individuals, and even fish and game clubs, have asked for a bounty on these fish ducks or sawbills. We would suggest placing a bounty on human fish-hogs who kill more game fish in one lake than all the sawbills could kill in any one county. Make it big enough and we could get some cash as well as sport. One proposal is as logical as the other."

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A just criticism from Miss Hortense Davis, of Pass Christian, Mississippi, points out that we should not have printed, in our December rotogravure section, the picture of the Boston terrier with cropped ears. When the dog series was being prepared, this dog's ears were unnoticed, although once the fact is pointed out, it is easily seen that the ears have been clipped. We hasten to explain that the publication of the picture did not mean we condone ear-cropping. Cropping is a crime against the dog, a brutal practice and, in the words of Albert Payson Terhune, "a vile operation." The American Humane Association, Albany, N. Y., campaigning against this practice, asks dog lovers everywhere to help carry on the fight for its abolition.

The following Congressmen have been appointed to the Joint Congressional Committee on Reorganization, to be set up to consider governmental reorganization as recommended in President Roosevelt's message to the Congress: Representative Buchanan of Texas, chairman, and Representatives Cochran of Missouri, Warren of North Carolina, Robertson of Virginia, Vinson of Kentucky, Taber of New York and Gifford of Massachusetts. The Senate has not yet appointed its members to the Joint Committee.

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John G. Worley, judge of the common pleas court, Cadiz, Ohio, favors us with a letter of praise on the "Propaganda" editorial that appeared in our November issue. He also comments on the recent articles on the Columbia River salmon situation, stating that "few publications have the courage to state the truth on this and other matters."

Judge Worley, obviously a conservationist, continues:

"The Finley article on fisheries did not hesitate, for fear of incurring the displeasure of those now in power, to tell the effect of inefficient or corrupt officials. A magazine that dares to speak out ought to be supported for its courage, even if it were not valuable otherwise, and Nature Magazine fills both these qualifications admirably. Let me congratulate you on presenting to the growing field of those genuinely interested in outdoor matters the best all around publication for Nature lovers.

CONGRESS AND CONSERVATION

(Continued from page 173)

land; Federal consent to state compacts for protection of migratory fish on the Atlantic coast; and possible legislation to bring floating fish plants outside the three mile limit under the direction of the Bureau of Fisheries, and extending all catch limits to the 12-mile limit.

Pertinent facts brought out at committee hearings included:

1. Testimony from the Biological Survey that the first essential for a successful wildlife program is *land.* The Federal Government now has less than 4,000,000 acres under its administration primarily for wildlife, and wildlife deserves far more.

2. No wildlife program can be complete or successful without adequate laws for protection *and the competent enforcement thereof.* The Biological Survey recommended that the Migratory Bird Conservation Act be amended to authorize seizure of automobiles, boats, guns and other equipment used in unlawful taking of wild birds and animals on Federal refuges and sanctuaries, and giving power to the courts to order such seized equipment forfeited in addition to any fine that might be imposed.

3. The complete rehabilitation of our country for the needs of migratory waterfowl, without conflicting with other agencies and without appreciable industrial or economic loss, *requires the restoration of 7,500,000 acres,* approximately half of which are now held in non-economic or unwise industrial or agricultural usage.

4. It is neither widely known nor well understood that adequate management of forests and woodlands contributes definitely and directly to wildlife welfare, while forest exploitation depletes it. *Forest exploitation is still the rule* on privately-owned forest land of the United States.

5. In the National Parks and Monuments alone are all species of wildlife protected. The total area involved is only 15,491,627 acres. Not one park is large enough to provide year-round sanctuary for adequate populations of all resident species.

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Other measures introduced in Congress of interest to conservationists are S.695, to provide for the creation of Saratoga National Historical Park, by Senator Royal S. Copeland of New York and S.903, to insure a continuous and ample supply of forest products and to secure the benefits of forests in regulation of water supply and stream flow, and for prevention of soil erosion, by Senator Charles L. McNary of Oregon.

OIL—AND SALT DOMES

By RAYMOND E. JANSSEN

Photographs by the author

OIL! What is it? Where is it found? Why is it there? How deep does it occur? What is an oil field? In order to answer questions we knew would be asked by thousands of Texas Centennial visitors, the University of Texas decided to build a model of one of the State's typical oil fields—a model that would clearly show the relation of the oil-bearing strata to the producing area on the surface.

The requirements for such a model were exemplified in the Barbers Hill oil field located at Mont Belvieu, Texas, not far from Houston. This field is a salt dome type oil field and is characteristic of many fields in the Gulf coastal region of the United States. Oil production began at the Barbers Hill field in 1918, and since then it has become one of the important oil fields of Texas. It was appropriate, therefore, that this particular field should be selected as the subject for a representative model.

The construction of an accurate scale model of such a field is a small engineering task in itself. First the oil well drilling records must be studied and properly interpreted. From samples of the drill cores, the nature of the rock strata at various depths is learned. Maps and photographs of the surface area must be made, and these correlated with the sub-surface data. From such information, charts are drawn so that the entire geological structure of the field is accurately shown. It is then possible to begin the designing of the model itself.

Such fields as the Barbers Hill field are characterized by the presence of huge sub-surface masses of rock salt known as salt domes. These salt domes, or salt plugs as they are sometimes called, are frequently several miles in diameter, and extend from unknown depths within the interior of the earth to near the surface.

Strangely, these salt domes have no direct connection with the oil that is found in association with them. During past ages these masses of almost pure salt were forced upward from the interior of the earth. As they pushed their way up through the horizontal earth strata, the rock layers through which they passed were tilted upward and left inclined around the sides of the salt domes. This may be illustrated by pushing a lead pencil up through a sheet of paper. The frayed edges of the paper are thus tilted upward around the pencil. The pencil represents the salt dome, and the sheet of paper a stratum of earth. The source and cause of these salt dome intrusions are as yet a mystery to Science.

AN OIL FIELD CROSS-SECTION

Constructed on a scale of 250 feet to one inch, this model shows the salt dome flanked by upturned rock strata

Oil, formed long before the intrusion of the salt plugs, occurs in sand layers situated between harder layers of rock or shale. Oil has a lower specific gravity than water, and because water also occurs throughout sub-surface strata, there is a constant tendency for oil to seek a relatively higher level than the water. After the oil-bearing strata were tilted upward around the salt domes, there resulted a tendency for the oil to migrate to these higher levels and col-

THE OIL TOWN IN MINIATURE

This surface picture of the model is not unlike an airplane photograph of the actual oil field. Note the village in the center surrounded by the derricks

lect in pools where further movement was blocked by the walls of the salt domes. Oil wells situated so as to penetrate the oil sands around the sides of salt domes therefore produce a maximum yield of oil.

The model, therefore, was to represent an oil field of the salt dome type. The first step in the building of such a model is the construction of a framework. The location of every section of the frame must be carefully predetermined in order that it will adequately support, but not interfere with, the numerous features to be shown in the completed model. This frame is then covered with hardware netting shaped to conform to the desired contour of the rock surfaces. Experienced hands must then model in colored plaster an exact imitation of the rock layers as well as the central portion representing the intruded salt dome. The darker-colored oil-bearing horizons are made of actual oil sands brought up from the interior of the earth in drill cores. Over the top of the salt is modelled a so-called "cap rock." The cap rock is an agglomerate mass of mineral materials consisting largely of lime, gypsum, anhydrite and sulphur, formed over the top of the salt when it forced its way up through the sub-surface strata. Small gauge wire flanking the sides of the salt dome represents the oil well casings which penetrate to the several oil-bearing horizons.

Over the entire top of the model is reproduced the land surface with its tiny buildings, oil derricks, pump houses, storage tanks, roads, trees and fields—all accurately reproduced in minute detail. This surface represents a land area of twelve square miles, within which is located the oil town of Mont Belvieu, surrounded by the circular oil field itself. In designing the top surface of the model, both airplane maps and contour maps were used.

As a whole, the model represents in reduced scale a solid block of the earth's crust, twenty-four cubic miles in size, in the center of which is the intruded salt dome flanked by the upturned oil-bearing strata. The salt dome itself is approximately two miles in diameter. Each side of the model represents a horizontal distance of three and a half miles and a depth of two miles. Most of the oil pools occur at depths varying from a thousand to seven thousand feet, and are located in strata formed during the Pliocene, Miocene and Oligocene periods of the earth's history. The oil itself was formed millions of years ago from decayed plant and animal remains.

The model, which is six feet square and five feet high, was built to a scale of 250 feet to an inch. It required four months to build, and was designed as a permanent exhibit for the new Texas Memorial Museum of the University of Texas at Austin.

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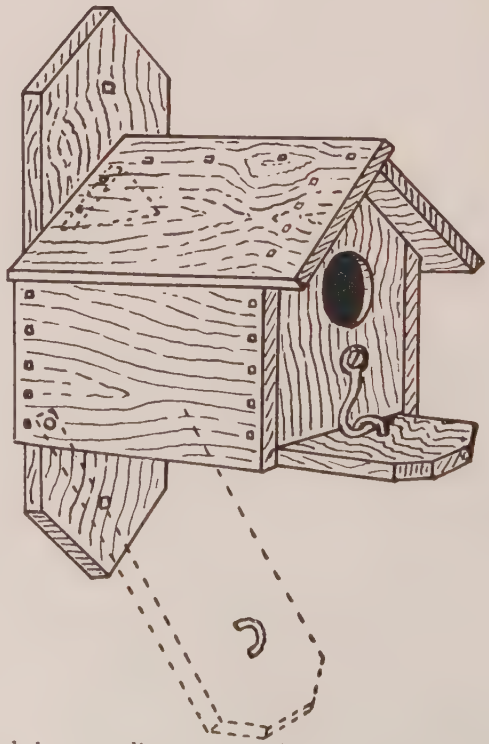
ENCOURAGING THE WRENS

By S. F. AARON

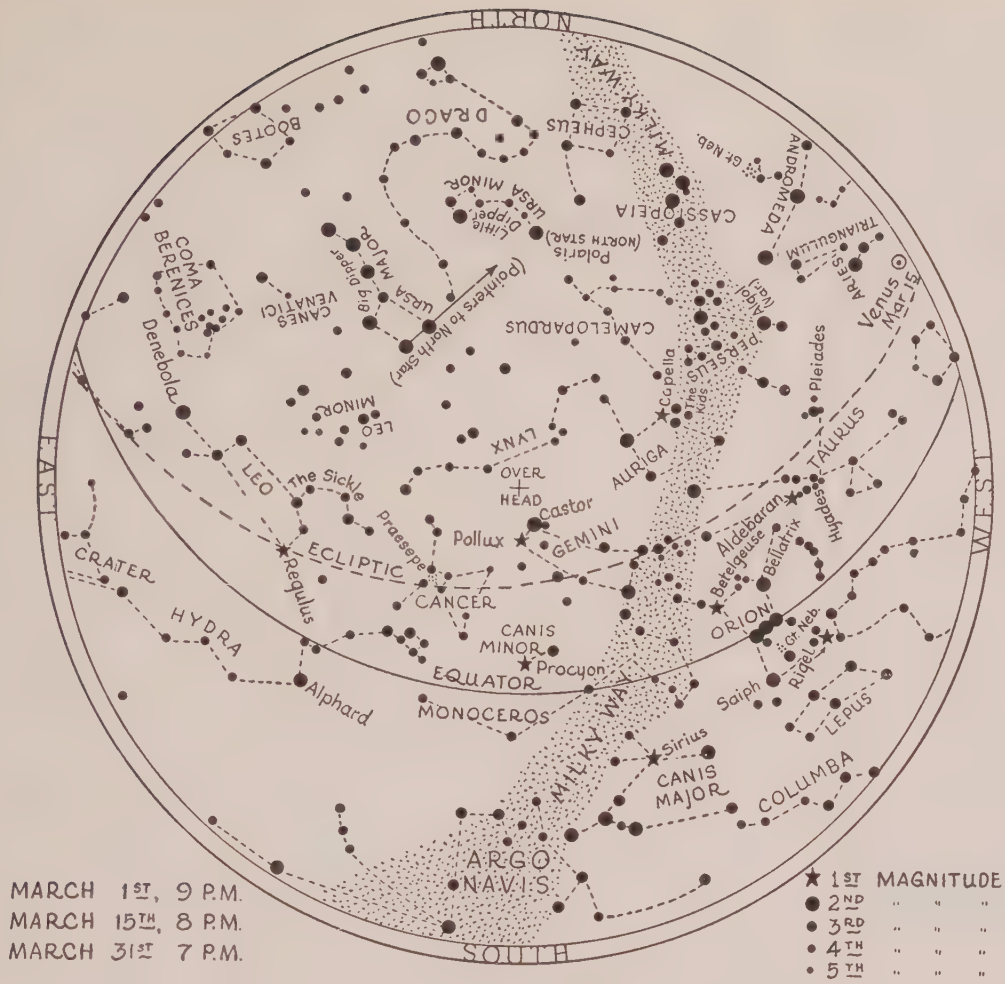
TWO IMPORTANT conditions are generally overlooked when homes for the house wren are provided. Cleanliness and freedom from vermin are two concerns of most birds. They are seldom entirely rid of lice or mites, but they make an effort to be by changing their nesting places from year to year. Strange to say, the birds can somehow tell when the pests are present in considerable numbers, and, if the vermin are not too many, wrens may raise two broods in the same nesting site. If the house is emptied of the nesting material and the house cleaned, the birds will readily use it for the second brood.



Wrens differ individually. Some are so particular that they will not use the house they occupied the preceding year, but will in two years, perhaps knowing from instinct or experience that insect pests cannot survive without food.

Therefore it is very wise to have a wren house that can easily be cleaned out and the best possible method is to hinge and hook the floor and outside perch or porch so that it may be dropped down and the inside cleaned in a jiffy, as shown herewith. Two small hinges, preferably brass so they will not rust, may be placed underneath where the bottom joins the support; or two long brads may be driven through the sides of the house and into the edges of the hinged piece at the pivoting point. A stout hook placed so as to remain fastened is the best way to hold the bottom in place. A cupful of scalding water tossed up into the thus opened house will kill all pests and their eggs.

Another essential is to so place the wren house that the young birds, when making their first flight on weak wings, may reach shrubbery or vines well up from the ground and away from the eager cat or chickens. A distance of five or six feet is safe.



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south.

HEAVENLY YARDSTICKS

By ISABEL M. LEWIS

ALTHOUGH the mile or the kilometer may be suitable units for measuring distances on our own planet or even the distances of the sun, moon and planets and other members of our own solar system, they become hopelessly inadequate as units for the measurement of the inconceivably great distances that separate us from even the nearest of the heavenly bodies that lie beyond the solar system.

A more useful unit than mile or kilometer for the measurement of distances within the solar system, and one that is often used, is the distance from the earth to the sun, or the astronomical unit, as it is called, which is equal, approximately, to 92,900,000 miles. This is too small a unit for the measurement of stellar distances, however, and is never used for that purpose.

When a larger and more convenient unit was sought for measuring the distances of the stars the velocity of light seemed to be exactly what was needed. As light travels 186,000 miles in one second, a little arithmetic will show us that it will cover a distance of nearly six trillion, or 5880 billion miles in one year. This is equal to 63,310 astronomical units or 63,310 times 92,900,000 miles. The distance that light travels in one year was therefore adopted as the unit of measurement of stellar distances and was called the light-year. If a star were at a distance of one light-year, then its distance from the earth would be 63,310 astronomical units and its light would take one year to reach the earth traveling at the rate of 186,000 miles every second. So far no star has been found to be even this close to the solar system. The star nearest to the earth, at a distance of 4 1/5 light years, is Proxima Centauri, a faint star of 11th magnitude about two degrees from Alpha Centauri. It is only 1/20,000 as bright as Alpha Centauri which, until the

discovery of this star, was believed to be the nearest star to the earth.

The ratio of the astronomical unit—92,900,000 miles—to the light-year—5880 billion miles—is almost exactly the same as the ratio of an inch to a mile. If we should make a drawing to scale of the solar system, representing by one inch the distance of the earth from the sun, we would have to represent the nearest star by a small dot at a distance of 4⅕ miles.

Since the first measurements of the distances of the nearest stars were made about a century ago, our knowledge of stellar distances and of the size and extent of the universe has increased enormously. We know now of the existence of stars, star-clusters and nebulæ at distances of thousands, tens of thousands, hundreds of thousands, and even millions of light-years. Our solar system shrinks to the size of a microscopic speck in a galaxy that has a possible extent of 300,000 light-years, and far beyond this galaxy lie others at distances of tens, and even hundreds of *millions* of light-years. In his investigations of the size, shape and extent of the universe the astronomer has found it convenient to adopt another unit of measurement—the parsec—which is equal to 3.26 light-years. This is the distance at which the parallax of a star has a value of one second of arc, the word parsec being a combination of the first three letters in the words *parallax* and *second*. A parsec is equal to 206,265 astronomical units.

Within the solar system the parallax of a body as the sun, or moon, or a planet, is the angle at the body subtended by the radius of the earth. It is, in other words, the angular size of the earth's radius as seen from the body in question. The parallax of a star, however, is the angle at the star subtended by the astronomical unit, or distance from the earth to the sun. If this angle were one second of arc the parallax of the star would be one second and the distance of the star from the earth would be one parsec. If the parallax were one-tenth of a second the star would be at a distance of ten parsecs, or 32.6 light-years, and if it were one-hundredth of a second the distance would be one hundred parsecs or 326 light-years. If one star is ten times more distant than another, its parallax, or the arc subtended at it by the radius of the earth's orbit, is only one-tenth that of the nearer star. It is a simple matter to change parsecs into light-years, or vice versa, if one remembers that a parsec is 3.26 light-years or that the parallax of a star at this number of light-years from the earth is one second of arc. No star has a parallax as great as one second of arc, so no star is within one parsec, or 3.26 light-years, of the earth. The greatest parallax known, 0″.78, is that of Proxima Centauri.

Kiloparsecs and megaparsecs are other units used occasionally in the measurement of great distances such as the distances of stars, clusters and nebulæ that are thousands or millions of light-years from the earth. A kiloparsec is equal to a thousand parsecs, or 3260 light-years, and a megaparsec to a million parsecs, or 3,260,000 light-years. The only known objects whose distances would be measured in terms of megaparsecs are the faint spiral nebulæ, or island universes, that are receding from the earth at such high velocities and that are tens and hundreds of millions of light-years from the earth.

Although the parsec may be the more suitable unit for scientific purposes most of us will prefer the better-known and more popular light-year which not only tells us how distant the object is but also how long the light that is now reaching us from that object has been on its way and when it started on its journey.

The Great Nebula in Orion is at a distance of about 650 light-years, which means that we see that nebula today as it was six and a half centuries ago when the light now reaching us started on its journey; or we may say that it is at a distance of about 200 parsecs which also gives us the information that the parallax of this nebula, that is, the angular separation of earth and sun viewed from the Great Nebula, is only one two-hundredth of a second of arc. At the distance of the nearest star it is only seventy-eight hundredths of a second. Even if the earth were a sun as bright as our own sun it would be difficult to see the two as separate bodies at that distance with the aid of the most powerful telescope. As the planets are dark bodies shining only by reflected light, and even the largest of them, Jupiter, has a diameter less than one-thousandth that of the sun, it is certain that they are hopelessly invisible at the distance of the nearest of the stars.

March is one of the best months of the year to begin the study of the constellations. In the western half of the sky may still be seen, in the early evening hours, all of the finest of the winter constellations, Taurus, with its Pleiades and Hyades, Orion, Auriga, Canis Major and Canis Minor and near the meridian, Gemini. Seven of the twenty brightest stars are in these few constellations. In the eastern sky is the Big Dipper, high in the northeast, and Leo with its first magnitude star Regulus, in the Sickle. The blade of the Sickle outlines the head of Leo, while Regulus is also Cor Leonis, or Heart of The Lion. Two more stars of first magnitude, Arcturus in Boötes and Spica in Virgo, will soon be visible in the east. The great splendor of the winter constellations as compared to the mild radiance of those of spring is striking at this time. The presence of the Milky Way in the western half of the sky serves to accentuate this difference. This month, also, we have Venus in the western evening sky and on the 12th it attains its greatest brilliancy. Then, viewed through the telescope, it will exhibit the phase of the crescent moon. Saturn is in conjunction with the sun on the 16th so will be invisible this month. Jupiter is now visible in the southeast before sunrise. Mars may be seen after midnight and is increasing in brightness. Mercury will be too near the sun to be seen this month. The sun will cross the equator coming north on March 20 at 7:45 P. M. E.S.T., marking the beginning of spring.

Summer Nature Camp

The Pennsylvania State College announces it its Nature Camp, as part of its summer sions, will open June 25, offering two ee-week courses for Nature students and chers. The camp is ideally located in the rt of the Seven Sisters Mountains, sixteen les from the college campus, in a region ounding with game animals. The camp is igned for teachers in public schools and leges, and others who have not had the portunity for field study and outdoor ex- ience.

Its aim is to make all students familiar h the local trees, flowers, ferns, insects, ds, and mammals and to train them along several lines of Nature study and ele- ntary science. Field trips, conferences, tures, plays and entertainments, and week- Sunday religious meetings feature the np's program. Applicants for admission the camp must be graduates of an ap- oved four-year high school or be employed teachers. Both men and women are eligi- , and those interested may obtain more ormation by writing to Professor George Green, Director, Nature Camps, The nsylvania State College, State College,

Pillsbury's Picturing

Many have seen the remarkable pictures en by Arthur C. Pillsbury, but few have own much about the man who took them, fewer still have appreciated the great or they represent. The opportunity is now ered to know of this man's works through book he has written under the title of *turing Miracles of Plant and Animal Life.* ploying a lapse of time photography, Mr. llsbury has produced motion pictures of the span of many plants, unreeling the un- ding bloom of an orchid, the develop- nt of bread-mold, and other amazing life ies. Working with the microscope and era, he has uncovered other miracles of ture and recorded them, and the story of w he has done this and other things in otography make fascinating reading for the an as well as the photographer. This rthwhile book is published by J. B. Lip- ott and sells for three dollars.

Childhood Series

In its splendid five-volume set of books ught out under the group title of *Child- ood*, the Houghton Mifflin Company has oted the third volume to Nature. This set books is designed for use by the parent the teacher, providing a vehicle in which lt and child can fare forth together into s wondrous and fascinating world. Besides ng of great value in informing and di- ting the youthful mind, we suspect that majority of adults will find themselves ng informed and directed at the same e. Bertha Stevens is the author of this ume on Nature, and it and its companion ks have been edited for the Association Childhood Education. Effectively and ractively illustrated, logically organized l entirely free from pedantry and textbook tics, these books fill a distinct need. We e that there are enough intelligent parents o will give the time and thought to rowing up again" with their children to t this series of books to wide and effec- e use. We cannot imagine such a parent getting both inspiration and help from m.

GONE is the old story-book fallacy of "ice-box" Alaska, for outdoor-minded Americans have found the *real* Alaska to be an amazing land of two contrasting seasons. A winter — in most sections warmer than many States — that turns like a changing wind into an extended summer season. During this glorious Alaska vacationtime, the Midnight Sun lures nature-loving vacationists to incredible trails of adventure . . . actually beginning as you step aboard a fast, safe, air-conditioned train and enjoy modern travel luxuries speeding over scenic routes to the Evergreen Playground.

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Hiking and Camping Forum

Conducted by

ERNEST A. DENCH

Hiking and Camping inquiries will be answered by mail if a stamped addressed envelope is enclosed. Address the Forum editor

Leisurely Travel on Spring Trails

Or, what the marathoner misses

"WHAT'S your hurry?" was our smiling comment to the lithe fellow who passed us on the trail. "A friend did the six mountains and fifteen miles between here and Boardville in five hours—and I'm out to beat his record," was his rejoinder.

"What an ideal spring day to take it easy," we mused as the hills marathoner quickly disappeared from view. All that the trip meant to him at this glad season was the opportunity to "improve" upon a timetable. Rough trails and steep climbing grades make this two-miles-an-hour terrain for the hiker of average gait. There is a time and a place for the fast travel, just as there is for the slower kind. Let this sink in: *The faster you go, the less you see each mile.* And absorb this truism: *The slower you go, the more you see each mile.*

It all hinges on what you *don't* wish to see. After a trying working week in the big city, the speediest form of locomotion to the countryside is justified.

You are now at Nature's Gateway. Take your time, no matter whether you are camping in a trailer coach, proceeding on horseback, pedaling a bicycle or going on foot.

Spring is the shortest of the four seasons. We know the calendar challenges the accuracy of this statement, but our main concern is the lush phase of spring—the woodland flower carpet and the full greening of the trees and shrubs. It lasts about a fortnight where we live. While earlier signs of Spring are evident, they lack the spectacular appeal of the later lushness. The prettiest late spring is produced by plenty of soft rain. It should, for the pleasure of weekenders, fall from Monday to Friday. A spell of abnormally hot weather soon makes the countryside look like early summer.

Let us follow some spring-decked trails with a hiking club. The leader, better known as "Swampy," instinctively takes a lowlands route, where the season's first peeper chorus is heard.

Next week he has a large party in tow over a section of the Appalachian Trail. One small area is literally covered with trailing arbutus. Were it a weed or a common wild flower, the maintenance group would have exterminated it in the interests of an immaculately cleared path. The hikers detour with reverent care. Some stoop down to sniff the fragrant blossoms, while others examine them in minute detail under a magnifying glass.

Now, a week later, the spring flowers are coming along too fast for all of them to be identified except by advanced amateur botanists. Pocket-size wild flower books are well thumbed on this trip.

Next comes the Sunday when the woods re-acquire their mystic charm. They have betrayed their secrets since mid-fall, but now they keep us guessing what lies over yonder. The end of the luncheon hour finds the hikers reclining under the full shade of the trees or outstretched on last season's leaf crop. The schedule can go to hang for all the leader cares; he, too, has succumbed to this balmy spring day. They are underway after two hours of perfect laziness. Hardly more than an hour later an abandoned farm is the center of attraction. A tragic discovery is two drowned baby rabbits in a well. The brighter side of this optional side trip is contributed by a scraggly lilac bush in bloom.

Sometime during the period covered by the foregoing trips the dreaded Black Fly Sunday will have put in its appearance. The tiny insects contrive to get into everything—human eyes particularly. Fortunately, they abhor breezy locations, so the highest point in the vicinity becomes the luncheon site.

What of the Camper?

The spring camper, who usually loafs with eyes and ears alert, sees more per foot than the hiker does in a furlong. His patience is rewarded by a bird or animal staying long enough to perform a trick or two—or maybe more, if the camper remains motionless. When the shades of night have fallen over the camp, its occupant does not lack for companionship. There is the hoot of an owl, maybe the mating call of some animal, to say nothing of the many mysterious stirs in the underbrush.

If a practical mood steals over the camper, he watches the individual performances of the burning wood—observations useful in camp cookery operations. He now has a craving for something sweet, appeased by the cake of chocolate he almost tossed out from his heavy pack on leaving home. After fixing the fire for the night, the camper enters his sleeping bag. At dawn he is aroused by the bird chorus. On his way to the brook for breakfast coffee water and ablutions, he glimpses the flash of a white tail vanishing in the (Continued on page 187)

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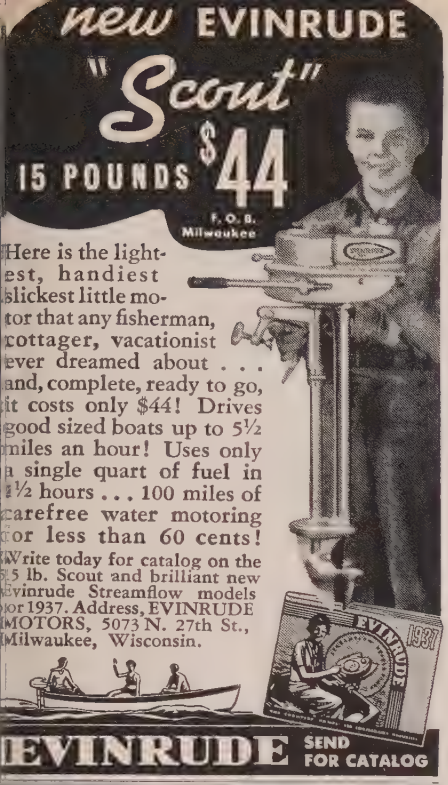

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The A. I. ROOT COMPANY, Box H-50, Medina, Ohio

PHOTOGRAPHIC NOTES

(Continued from page 131)

providing the procedure is carefully executed. A small booklet entitled *Lantern Slides* is available from this department without charge. Printing, development, reducing, varnishing, binding, and many formulas are presented in their consecutive order and the process simplified so that directions are easily followed. Please send a stamped self addressed envelope.

From the Eastman Kodak Co., Rochester, N. Y. comes news of the new Retina camera. Much improved in design and equipped with the newly developed Ektar lens, the camera takes its place with high precision 35 MM cameras.

Eastman also announces at this time the Model E Ciné Kodak. This camera presents a new departure in design both in mechanical operation and outward appearance. This new camera takes either 50 or 100 foot rolls of black and white and Kodachrome 16 MM film. Further details regarding either of the above cameras are available from the manufacturers.

The Weston Electrical Instrument Corp., Newark, N. J., sends news of the new *Ciné Exposure Meter, Model 819.* Similar in appearance to the Universal Model 650 it embodies a new principle in the pre-set type dial which permits instantaneous reading. All scales are set previous to the reading and the meter is then pointed toward the subject. On the dial, under the number indicated by the meter, the correct iris setting is indicated. Further news from the manufacturer.

We learn that a committee, headed by Gustave Fassin of the Bausch & Lomb Scientific Bureau, Rochester, N. Y., has been appointed to arrange exhibits for the first International Exhibition of Applied Scientific Photography. Scientists all over the world have been contacted in order to make the exhibition fully representative of the many fields of applied and scientific photography. Astronomical photography, photomicrography, color, aerial, press and high speed photography are some of the groups in which the sponsors are interested. Complete information will be supplied by Mr. Fassin.

The Trojan agitator has just been announced by the Central Camera Co., 230 So. Wabash Ave., Chicago, Ill. By the simple manipulation of placing the developing tank on the agitator and a slight motion of the hand, the tank will rock back and forth in a circular motion. This is a useful gadget that deserves investigation. It is suggested that when writing to Central you ask for their latest bargain book. Many valuable buys are listed.

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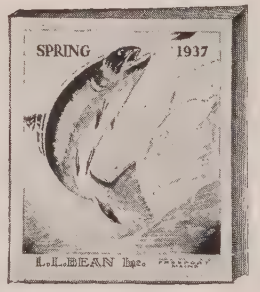

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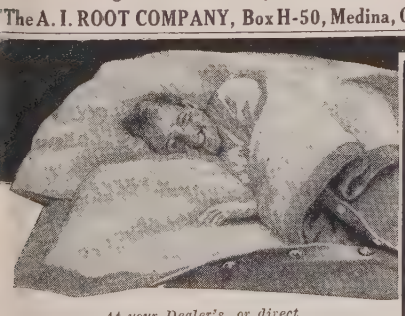

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Nature Magazine in School

A Department of Aid to the Teacher

In order that teachers and parents may further use Nature Magazine as an aid to the study of Nature and Science, this page is devoted to the following brief notes based upon articles in this issue and suggesting ways in which they may be used as a source of inspiration and information. To bring these Nature study thoughts to our readers we have obtained the services of one eminently qualified for the task, and this department is edited

BY ESTHER SCOTT

Instructor in charge of Elementary Science
Washington, D. C., Schools

●

One Answer to an Old Question

This is a conservative answer. By some biologists, mind and consciousness are attributed not only to members of the animal kingdom but to plants as well; indeed, wherever there is life. Not many laymen are equipped to investigate this subject in the plant kingdom, but many of us can collect evidence by observing animals and noting evidences of memory such as is evidenced by the goldfish learning to come to the surface at the sight of the hand that feeds it, planning as is described in this article, and sympathy as is shown by a dog for his master in distress.

In comparing the behavior of the anthropoid apes and man, it is well to remember that these creatures have the same parts in their brains as man, the difference being that certain parts have become highly developed in one while in the other certain other parts have been favored.

●

Pet Otters

By comparing the present day range and abundance of the otter with that of a hundred years ago, one can see the danger of extermination for this most interesting carnivore. It has some very special adaptations that are quite useless to it when confronted with the steel trap. Many adaptations are mentioned in the article. Some pupils would like to read the article to see how many of these they could find, for instance, sitting on "a firm tripod of hindlegs and tail". Other pupils could look up the home life of a wild otter and make a "movie" of it to show the class. Such "movies" are made of long strips of paper cut as wide as the "stage" is high. One edge of the strip is rolled on a section of broom handle that is fastened so as to turn at one side of the stage. It is unwound by winding the paper on to another section of broom handle being turned at the other side of the "stage".

●

Azalea and Camellia Time in the Deep South

Garden-minded children reading this article would wander with the author through the open garden gates and feel the sweet influence of the century-old azaleas and camellias so delightfully described.

However, in our schools, rural as well as urban, we have other children whose lives have never been touched by any feeling of appreciation of the charm of a garden or the splendor of an untouched wilderness. The cultural and beneficent influences of a garden can do much to develop character, far more than many educators yet realize. A most practical and effective way to introduce pupils to the lifelong joy of comradeship with the out-of-doors is by means of the school garden. A small strip of ground about a school building can be utilized for this purpose. In such a limited garden, or even in one of more pretentious proportions, part of the space should be used for perennials. These flowers help to give some idea of the time element involved in producing beautiful effects. Azaleas, camellias and lilacs are excellent in the south; in the north, hardy forsythias and spireas. This article has good planting directions for azaleas and camellias. Since the planting and raising of perennial shrubs extends over many school years, a scrap book or other record should be kept and passed on from class to class to give continuity to the project. The record of the planting and soil preparation should include free hand drawings, photographs and should list the names of all the pupils who participated. Each class following could add to the record and perhaps plant something themselves. In addition to using scrap books a certain school, having a very large school garden, has slides made showing the special projects undertaken each year. At the beginning of the garden season, an assembly is held and the slides of former years are shown to give an idea of how much the garden has improved and which pupils have participated in making it lovely. By such means as these pupils gain a feeling of success and of "belonging" to the project, and from these in turn there develops that warm glow of satisfaction that is so essential to an appreciation of the out-of-doors.

●

Sea Iguanas of the Galapagos

No one really knows how these strange reptiles are related to those of prehistoric times, why they are found today only on the Galapagos Islands, nor why they restrict themselves to a diet of seaweed. It would be unfortunate for our pupils if in our teaching we gave the impression that all the problems of Nature can be answered, so these strange creatures are a good subject for work by some of the more mature minds interested in biology. Besides the marine iguanas, the giant tortoises and the Galapagos finches are also puzzling species. Attention should be given to the near extermination of the giant tortoises by the oil hunters. Any reader of Nature Magazine would be shocked to see the great heaps of huge shells and how rare it is to find a living tortoise!

Straw Men in the Wilderness

This article, together with the inciting article published in the September, 1935 issue of Nature Magazine, would be excellent material for a debate. Older pupils should be given the opportunity to think out some of these problems in school before they are confronted by the same problems at the polls. In preparing the debate such questions might be considered as:

The relation of road construction to forest fires.

The more accessible the country the more smokers and campers will enter it and the number of fires will increase from matches, cigarettes, and camp-fires.

In inaccessible country, fires arising from natural causes have a much better chance to burn unchecked.

Could use of roads in wilderness areas be restricted to fire control?

The relation of road construction to inspirational values.

The restoring power of the forest to heal man's tortured nerves often comes from the entire absence of things that man has made—even roads.

The relation of artificial stream control to wild life.

The building of walls along streams prevents many wild creatures from coming to the stream to drink.

Artificial stream control is often futile as is clearly shown in our disastrous floods.

Reforestation of sufficient area in the headwaters of rivers and in the drainage basin would do much to control floods, and would incidentally help wild life.

●

Bird Study Hints

The Bureau of Biological Survey, Department of Agriculture, announces publication of a mimeographed leaflet, entitled *Some Suggestions for Bird Field Study*, that will be of interest to the beginning bird student. The leaflet covers data on the time to begin, equipment needed, where and when to go, field identifications, note-keeping and significance of the study. A useful bibliography also is included. The leaflet is available from the Survey by asking for Wildlife Research and Management Leaflet BS-76.

●

Hawaii's Trees

An interesting pamphlet, entitled *The Trees of the Kilauea-Mauna Loa Section, Hawaii National Park*, has been prepared by Park superintendent Edward G. Wingate and Assistant Park Naturalist Samuel H. Lamb in response to many requests for literature about the trees of the area. No attempt has been made to include complete botanical descriptions as it was believed most readers would be interested in a simple account of the trees and a discussion of their various uses. Those desiring more information can refer to the complete bibliography that is a part of the paper. The pamphlet is known as Natural History Bulletin Number 2 and is available from Park headquarters.

HIKING AND CAMPING FORUM

(Continued from page 184)

scrub. The other half of the story is not far away—a fresh hoof imprinted in the moist earth by the brook bank.

The longer the camper remains at the tranquil site which is his camp, the more reluctant he is to leave. Unfortunately, practical considerations must prevail, and at noon that day he sets out at a leisurely pace on the trail in order to reach his parked car before dusk.

Which of the three types of outdoor enthusiasts we have mentioned extracts the esthetic cupful from a spring outing? Certainly not the hills marathoner, who has no time to look at anything except the paint blaze ahead—and he may miss that in his feverish desire to clip minutes from the trip.

March Gadget List

1. A waxed luncheon paper pack which contains 200 interfolded sheets, each large enough for a single sandwich.

2. The camper who plans to make equipment items at home will be interested in a versatile power tool. It can be plugged in any AC or DC socket. Tool is workable on virtually all raw materials except textiles.

3. A canvas-lined work glove over which a black rubber solution has been coated. Very flexible glove, and not so easy to rip as all-rubber kind. Satisfactorily used on Forum camp cookery trips, and suitable for other rough (and also wet) outdoor chores.

4. New type of sled for children and adults who wish to remain young. It needs a slope, be it spread with snow, dry sand or powdered borax. This maker has, with his hardwood plaything, removed the sliding-off-the-seat hazard from Ash Can Sliding.

A, B, C and D. These are new food items, described elsewhere under *Campfire Breakfast Experiment No. 3.*

The *March Gadget List*, giving the additional information you need on the above 8 items, is available from the Forum editor for a self-enclosed stamped envelope.

Campfire Breakfast Experiment No. 3

Object: A quickly-prepared hot breakfast of 4 cooked items for 5 persons.

Equipment: 2 portable kerosene stoves and open wood fire.

Locale: Mountain top shelter on a bleak, windy day.

Approximate Cooking Time: 1 hour.

The Menu: (A) New tropical fruit juice blend—chiefly papaya, grapefruit and pineapple. Highly concentrated, it was mixed with 4 parts water for the right strength. Very sweet and resembles a soft drink without the fizz. (B) Combined cereal (cornmeal mostly) and meat product, recognized as Colonial Breakfast Mix in Boston, and scrapple in Philadelphia. Packed by an old-established New England firm in 12 oz. tins. One can yields 5 slices, which crumble in the frying pan if turned with a fork. A pancake turner avoids this. (C) English Muffins, packed six in a carton. These were toasted, cut in two, buttered, and a cooked slice of scrapple inserted. A very sustaining and filling hot sandwich on a winter's morning. (D) The left-over muffins were, a little later, spread with pure guava jelly, a handy 9½ oz.

(Continued on page 189)

Silent.... TYPEWRITING

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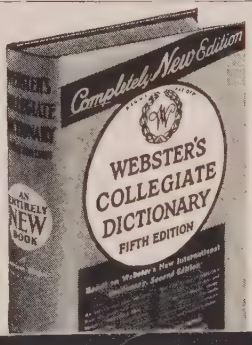

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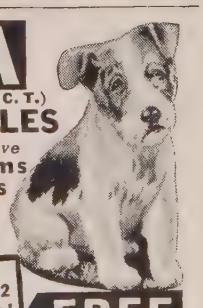

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SUMMER CAMPS FOR HEALTH

By Burke Edwards, Director, Camp Service Department

This is the time of year when every normal youngster begins to take a strange interest in the calendar, counting the weeks until the arrival of that momentous day in June that marks the closing of school. What are your plans for your son or daughter this summer? Have you thought of a summer camp, a spot far from the city's bustle, where your child can enjoy wholesome, outdoor life among young people of his or her own age?

There are hundreds of fine camps scattered throughout the United States, supervised by men and women of long experience in their field. These men and women can give your boy and girl a profitable and enjoyable vacation—a vacation that he or she will long remember.

After a winter's confining work in school, growing children should be allowed to spend the summer in the country. A hiking or fishing trip with you would be a fine thing for your son, but unfortunately few fathers can remain away from business all summer. Your son or daughter could visit relatives, but two or three months is a long visit! He or she might be taken to a sea or mountain resort, but there just isn't much fun for energetic youth at a summer hotel. A summer camp would be the solution; it would not only mean a vacation for your child, but one for you as well. Out door camp life means development of responsibility, judgment, self-dependence and sportsmanship in your child, and the assurance that he will return home healthier and stronger and eager to get back to school.

What camp to choose? There are camps at the seaside, in the mountains, on lake shores and on the prairies, each having its own particular excellent features. NATURE MAGAZINE'S Camp Service Department this year again is at your disposal to help you solve vacation problems for your children. We will be glad to answer personally any inquiry for camp information addressed to us.

Use convenient blank on this page.

Train for Park Service

Announcement is made of the thirteenth annual session of the Yosemite School of Field Natural History to be held in Yosemite National Park from June 21 to August 7. This school is conducted by the government for the training of National Park Service personnel. Its graduates are chosen for ranger, ranger naturalist, custodian, and park naturalist positions in National Parks and Monuments. For this summer fourteen men and six women possessing the requisite training and experience in the natural sciences will be selected.

No tuition fee is charged and cost to the student involves travel to Yosemite and incidental camping expenses. Field work predominates, a week being spent on a Research Reserve project and two weeks on a back-country pack trip for the study of flora, fauna and geology of the High Sierra. The staff that shares in the instruction is a distinguished one. Write to C. A. Harwell, Park Naturalist, Yosemite National Park, Director of this Field School, for an application blank and prospectus.

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HIKING AND CAMPING

(Continued from page 187)

parchment pot of which is put up for carrying on trail trips. Container weighs only one-half oz. Meal concluded with coffee and tea.

The *March Gadget List* tells where to procure the above food items. Write the Forum editor for it, enclosing a self-addressed stamped envelope.

Directory of North American Hiking, Mountaineering and Trail Organizations

Second Installment

●

Note: Clubs are listed where their activities are centered, and *not* where the contacting officials reside.

●

Symbols: C is exclusively a collegiate or high-school group; CT conducts trips; TAO is devoted to trail administration; TMO is confined to trail or shelter construction and maintenance. SU is status unknown.

●

Northern New York

Adirondack Mountain Club—Main Club Secretary: Paul E. Doherty, 120 Broadway, New York, N. Y. CT-TMO. Local Chapter Secretaries: **Adirondak Loj**, H. W. Hicks, Lake Placid Club, Essex County, N. Y. **Glens Falls**, William H. Brown, 65 Grant Ave., Glens Falls, N. Y.

Adirondack Trail Improvement Society—Henry Leach, 170 E. 64th St., New York, N. Y. TMO.

Borealis Outdoor Club—Walter Aures, 28 Phyllis Ave., Buffalo, N. Y. CT.

Skidmore College Outing Club—Margot Warner, Saratoga Springs, N. Y. C.

Central New York

Adirondack Mountain Club, Albany Chapter—Margaret C. Ward, 20 Morris St, Albany, N. Y. CT.

Catskill Mountain Club—Alexander Jessup, 50 Morningside Drive, New York, N. Y. TMO.

Endicott, N. Y. In August, 1936, Lawrence B. Price, 2009 Tracy St., Endicott, N. Y., contemplated forming a local club. No later information received.

Genesee Valley Hiking Club—Harriet Troan, 151 Aberdeen St., Rochester, N. Y. CT.

Mohawk Valley Hiking Club—Ramon L. Hall, 9 N. Church St., Schenectady, N. Y. CT-TMO.

New York State Trails Conference—Thomas F. Malone, 69 6th Ave., N., Troy, N. Y. TAO.

Pine Tree Hiking Club, Troy, N. Y. SU.

Rensselaer College Outing Club—Allen Barry, Waite Dormitory, Sage Ave., Troy, N. Y. C.

Shongum Outing Club—C. Keith Smiley, Mohonk Lake, Ulster Co., N. Y. CT.

Taconic Hiking Club—Edmour Germain, 1219 Jacob St., Troy, N. Y. CT.

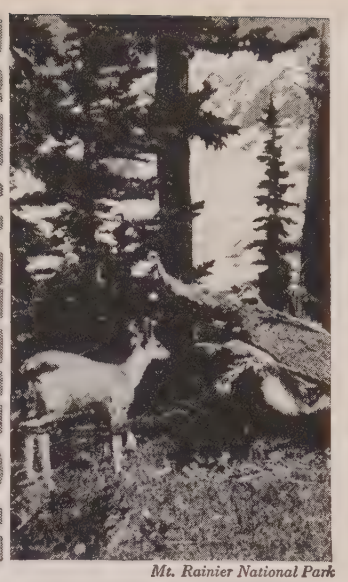
Trojan Trail Club, Troy, N. Y. SU.

Union Outing Club—Walter E. Williams, Old Gym Dormitory, Schenectady, N. Y. C.

Vassar College Outing Club—Marjorie Flynn, 342 Main Hall, Vassar College, Poughkeepsie, N. Y. C.

Village Hiking Club—Dr. Thelma Robinson, 21 Elk St., Albany, N. Y. SU.

PACIFIC NORTHWEST



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These prizes are offered for photographs of the most attractive Spring and Summer gardens entered in the Garden Contest being sponsored this year by Nature Magazine, Parents' Magazine, Christian Herald and Boy's Life, under the auspices of the National Garden Guide. Flower, fruit and vegetable gardens are all eligible. Awards will be made on the basis of the attractiveness of the gardens as shown in the photographs submitted.

Duplicate prizes will be awarded in case of a tie. The decisions of the judges, appointed by the National Garden Guide, will be final. Your Garden Contest Entry Blank can be obtained from any of the horticultural advertisers below, or from the Garden Contest Director of Nature Magazine, 1214 Sixteenth Street, N. W., Washington, D. C.

On the blank you will find space to mount the photograph of your garden and to write not more than 200 words of description about it. The only requirements for entry in this Garden Contest are (1) that you write in for your blank not later than June 1st, 1937, and (2) that you return it to us with your garden photograph and information about your garden not later than September 1st, 1937, the date on which the contest closes.

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A Good Grass Substitute

By Victor H. Ries

How can I grow grass under my map tree? How can I have grass on my front t race? How often these questions are aske The answer: Don't try to grow grass in i possible places, but use some other pla better adapted to these adverse conditio some plant that you do not feel you have mow, thereby loosening its foliage and ducing its vigor and vitality.

There are a number of different plants can use for this purpose. In fact, the wh subject of ground cover plants is becomi more and more popular as gardeners reali the importance of these grass substitutes.

One of the toughest and surest of all the ground cover plants is *Ajuga* or bugle-wee *Ajuga reptans* has dark green leaves an in wide and several inches in length, growi in rosettes. From this, very much as in sor weeds, side shoots grow out an inch or mo root, form a new rosette of leaves and so c In this way a considerable area is soon cove ed solid with this rich, dark green foliag From each cluster of leaves there arise, seve al inches above the foliage in the sprin clusters of dark blue flowers. There is a ho zontal-leaved variety and a variegated-leav variety. None of these are as vigorous as t

parent type and thus far not as satisfacto as ground cover.

The bugle-weed seems to grow equal well in sun or dense shade, being satisfacto under beach or maple trees. It can, in the su when growth is adequate, be mowed as gras Propagation is easy, being done merely b digging and transplanting the new rosette leaves as they develop.

The only drawback to *Ajuga* is that it not evergreen, although it is absolutely hard

Leica Manual

We hope that we may, without encroach ing on the private preserves of our Photo graphic Editor, Samuel Brown, record th arrival of the 1937 edition of the *Leic Manual* compiled by Willard D. Morga and Henry M. Lester, abetted by a consider able list of contributors. The publisher describe the book as "a manual for the ama teur and professional covering the entir field of Leica photography". That it indee is, and we cannot imagine anything that it ha overlooked. In its five-hundred pages there is a wealth of pictures, some setting forth the mechanics of photography, others illus trative of results. The publishers are Morga and Lester, 100 East 42nd Street, New York City.

A Cold Frame for Every Garden

By Victor H. Ries

The only difficulty about cold frames is at you never have enough of them. This ar you have one sash, next year two, and on. For after all, a cold frame is the most actical form of greenhouse for the average me gardener. Any kind of box or frame which a glass sash can be obtained will ; although the commercial cold frame sash, ee feet wide and six feet long, is especially de for this use, it is rather large and heavy a woman to handle, and, if used in groups ainst a building, is difficult to reach ross.

A frame made of cypress or redwood for manence, eight to ten inches high in front a few inches higher in back to give slope drainage, can face the south for full use the sun. Seeds of perennials can be sown it any time from November to June. Annu-, in the latitude of New York City and iddle Ohio, can be sown as early as April 1. e seeds may be sown directly in the frame, t if a great variety is to be sown many pre- to use small flats or pots in case any ve slow in germinating.

For a well-drained weed-free seed bed a ture of equal parts sand and peat moss be used. If the peat is fresh from the bale the sand right from the pit no weed seeds uld be present. A little difficulty may be countered in moistening the peat moss if dry. Several mixings and waterings may necessary. A 2-inch layer on top of the in the cold frame makes an adequate bed.

and or peat or both may be lightly sifted the seeds after sowing. If pots are used g them to within a half inch of the top more uniform moisture. Open the sash warm days to prevent spindling of seed- s after they start growing.

hese same frames, with burlap or boards r the sash, make satisfactory winter stor- for tender perennials.

For Shell Collectors

Shell collectors will be glad to learn that new type of shell book has made its ap- rance. The title is *Handbook for Shell llectors* and is unique in that each of the cimens illustrated is given a monetary ue as is done in stamp and coin catalogs. lter Freeman Webb, the author, believes t collectors will welcome a handbook that ludes this information, and recalls that o centuries ago there was spirited bidding shell auctions, and that only recently two rida shells were sold for $50 each. The ok, numbering nearly 300 pages, contains 00 illustrations and is available from the hor, 202 Westminster Road, Rochester, Y., for two dollars.

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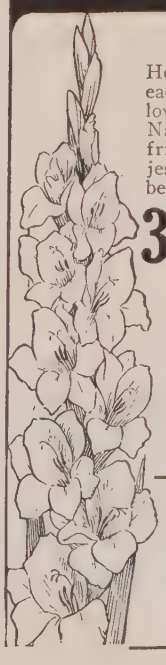

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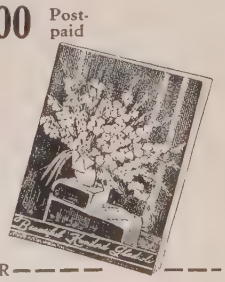

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Howard Zahniser is connected with t educational and publicity branch of t United States Biological Survey and may heard over the radio on the familiar "Fa and Home Hour" at frequent intervals. H also is a great lover of the outdoors, poet and good literature.

Walter J. Wilwerding, of Old Greenwi Connecticut, has spent considerable time the veldts and in the jungles of Afri studying the wildlife of that region. A N ture artist of merit, his work has appear on the covers of many outdoor magazin

Once upon a time **Wendell and Lu Chapman** had a hobby; that of going out to the woods and photographing vario types of wildlife. Their pictures and expe ences soon came to be in such demand th today they are the authors of several Natu books and many magazine articles, and a kept busy filling lecture engagements.

Annabelle Neusbaum lives near Mobi Alabama, where close proximity to the ann al display of the beautiful azaleas a camellias, for which that area is famou inspired her to tell our readers about it.

Explorer **Wolfgang Von Hagen** is a st dent of the fauna and flora of the tropic jungles of South America and at present engaged in a campaign to make the Ga pagos Islands a wildlife sanctuary as a m morial to Charles Darwin.

Particularly qualified to write about pla patents is **Harry Goldsmith**, an examiner the United States Patent Office.

Fred Morrell, an official in the Unit States Forest Service, in this issue preser his personal views relative to the country wilderness areas.

Raymond E. Janssen, who makes his hon at Evanston, Illinois, is associated with t technical staffs of the Field Museum Natural History and the Museum of Scien and Industry. A geologist and museum e hibit designer, Mr. Janssen arranged t geological exhibits for the centennial exhib tion of the University of Texas.

Attention California

According to plans perfected by the Co servation Week Committee, Californ Conservation Week will be celebrated t week beginning March 7, Luther Burbank birthday, during the years 1937, 1938 a 1939. Miss Pearl Chase, chairman, has urge nine state and Federal bureaus and depar ments and eight statewide conservation o ganizations to increase their efforts to pr serve the great natural resources of Californ and to broaden their educational activities

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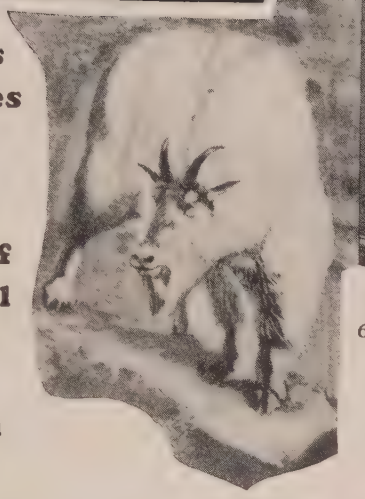

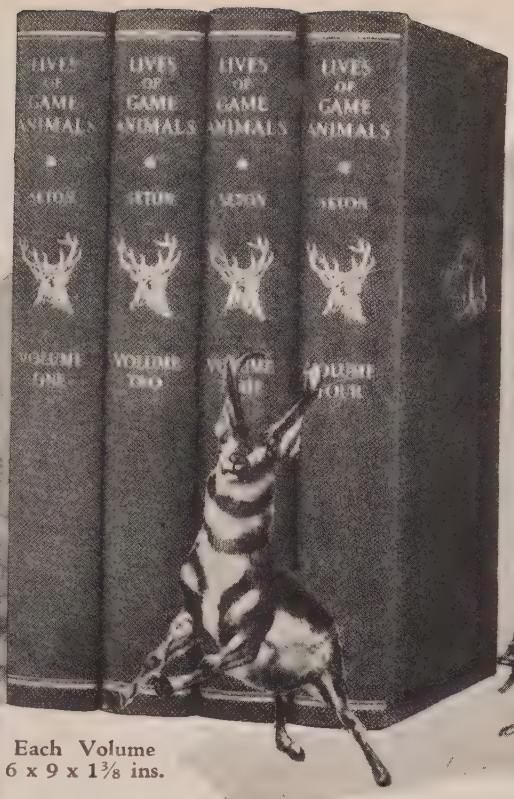

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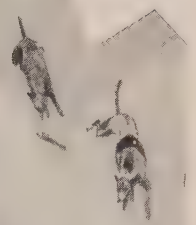

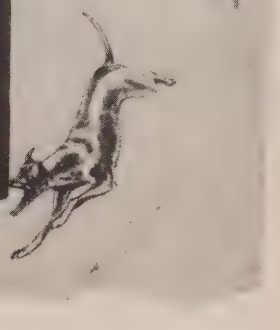

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Photographic Notes

BY SAMUEL BROWN

THE BIGHORN OR MOUNTAIN SHEEP MAKE INTERESTING SUBJECTS AND ARE EASILY CAUGHT WITH SIMPLE CAMERAS

Mammals on the Film

April finds spring well begun. The sun has melted the last traces of snow and ice and the bare branches suddenly have become covered with buds and leaves. Later an abundance of blossoms presents a gay pattern of colors. Birds have begun to build their nests, little animals are scurrying back and forth and as the days pass the skies are filled with white fleecy clouds. On every side are attractive photographic subjects that the owner of the simplest equipment can capture on his film.

Perhaps one of the most interesting photographic activities during the spring and summer is the making of a series of pictures depicting the life history of some mammals. Small ones, such as chipmunks, squirrels and rabbits, are particularly attractive subjects and easy to locate. The most important thing is to choose one subject, find its home and watch it carefully for any new developments. A good pair of binoculars will prove of considerable aid in finding subjects.

For the owner of single lens cameras, we suggest, as a useful accessory, a portrait attachment for close-ups. A tripod is helpful, particularly those that may be collapsed to within six or eight inches from the ground. With this equipment anyone can take good animal pictures.

With animals that are not timid it will be possible to secure good pictures that can be enlarged at a distance of eight or ten feet. However, for those animals that are wary it will be necessary to resort to a ruse for good results. The camera may be set up at or near the place where the animal is expected to appear. It is possible to bring the subject to one particular spot by placing some bait where they are sure to find it. A bright sunlit spot should be chosen and the camera carefully focused at this point. When the squirrel or chipmunk comes to claim his meal, it is an easy thing to snap the shutter. When a close-up is required, it is best to fasten the camera to some firm support and attach a string to the shutter release. The camera can then be operated from a distance.

RACCOONS AND OTHER SMALL MAMMALS ARE EASY MARKS FOR ALERT NATURE PHOTOGRAPHERS

The animal may be made to take its own picture. A stake with a screweye is driven into the ground and a stout thread, attached to the shutter release, is run through this to some bait on which the string is made secure. When the subject begins to eat, he encounters resistance and thus snaps his picture. Black thread is the most desirable color since this will not show in the picture.

Sometimes it is a good policy to camouflage the camera with some green foliage or twigs and branches so that the animals will quickly become accustomed to its presence. If this is done each time a picture is taken, there is a better chance for good results.

Shutter speeds faster than 1/100 of a second are rarely necessary while 1/25 of a second may be used most of the time. Whenever possible, pictures should be taken in open daylight so that small stops can be used. This assures sharpness and good depth of focus. Any fast chrome film will give excellent results while high speed panchromatics permit shorter shutter speeds or smaller diaphragm openings or both.

We have merely made a few suggestions for the animal photographer. Each occasion requires careful choice of point of view, selection of stop and exposure and, most important, the proper instant in which to snap the shutter. Animal photography is a fascinating and healthy outdoor activity and good results are conducive to a greater appreciation of Nature.

Films

The second of the color processes to be discussed by this department is *Kodachrome*. With this film the manufacturers have approached as close to the ideal color process as is possible at the present time. Kodachrome is obtainable in two forms especially sensitized for either pure daylight or Photoflood. Filters are unnecessary with either film except when one type is to be used with the light to which it is not especially sensitized, when compensating filters must be used.

Any color process depends on the separation of light into its three components—blue, green and red—and in Kodachrome this is accomplished by coating the film no less than five times! Nearest the base is an emulsion which is strongly sensitized to red. This in turn is coated with a thin separating layer of gelatin. The third coating is an emulsion which is green sensitive and this in turn is coated with another separating layer. The last coating is a blue sensitive emulsion which contains a yellow dye. Each coating is so thin that the total thickness is little more than that of ordinary film. Each emulsion is so adjusted that the sensitizers do not wander from one layer to another. When a picture is taken the three components of white light are automatically separated in the depth of the coatings, the red light image forming itself in the bottom layer, the green light image in the center and the blue light in the top layer. Intermediate colors register themselves on two or all three layers and white affects all three equally.

Since all processing of Kodachrome is done by the manufacturers with highly specialized and complicated machinery, a discussion of this process is unnecessary. However, it is of interest to know that the film focuses through three different focusing machines. Each step in the process reduces silver, adds colors, removes unnecessary silver and finally a transparency in natural colors results. The image formed in the red sensitive layer is transformed into a blue green positive, that formed in the green sensitive layer is dyed magenta and the image in the blue sensitive layer into a yellow positive. The final positive consists of layers of dyes and contains no silver.

Being based on the subtractive method of color photography, the objects that are red appear as this color because they are viewed

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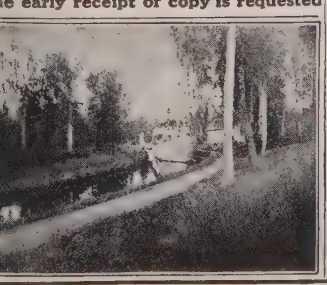

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After March 1, E. Leitz will be located at their new headquarters in the Hecksher Building, 730 Fifth Avenue, New York, N. Y., where greater facilities will be available for the demonstration of the Leica camera and its accessories. All readers of NATURE MAGAZINE are invited to visit the new quarters of E. Leitz.

The new Kodaslide projector for pro-

(Continued on page 245)

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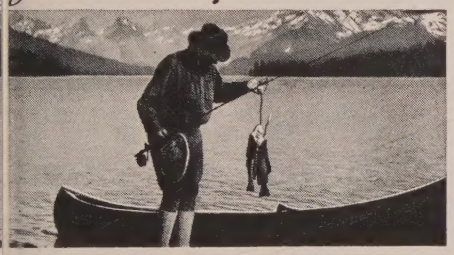

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Meet Our Authors

Dr. Carroll Lane Fenton, a well-known student of geology and paleontology, is the author of *The World of Fossils*, a popular book published by the D. Appleton-Century Co. of New York, and of other works. Dr. Fenton has spent the last four summers hiking through Glacier National Park and the Canadian Rockies, gathering material and studying the geology of the region.

Miss Joyce M. Jaeger, of the University of Wisconsin, based the interesting article appearing in this issue on interviews with C. D. Adams, chief apiary inspector, Wisconsin State Department of Entomology; Dr. C. L. Fluke, Professor of Entomology at the University of Wisconsin and C. E. Brown, director of the Wisconsin State Historical Museum.

Miss Elsa W. Reichert, of the Mirakel Optical Company, is an authority on the construction and use of binoculars and as such is well qualified to write on how to choose your Nature field glasses.

Miss Lois Torrance is a horticulturist and writer affiliated with the W. Atlee Burpee Company of Philadelphia.

Hugo H. Schroder, whose present address is Orlando, Florida, is a wildlife photographer and author who divides his time between the southern state and his home in Iowa.

Guy Van Duyn is a student of Nature at present connected with the Game Department of the Resettlement Administration at Brooksville, Florida.

Robert Marshall is Director of the Forestry Division of the Office of Indian Affairs and was a prime mover in the formation of the Wilderness Society, whose headquarters are in Washington, D. C.

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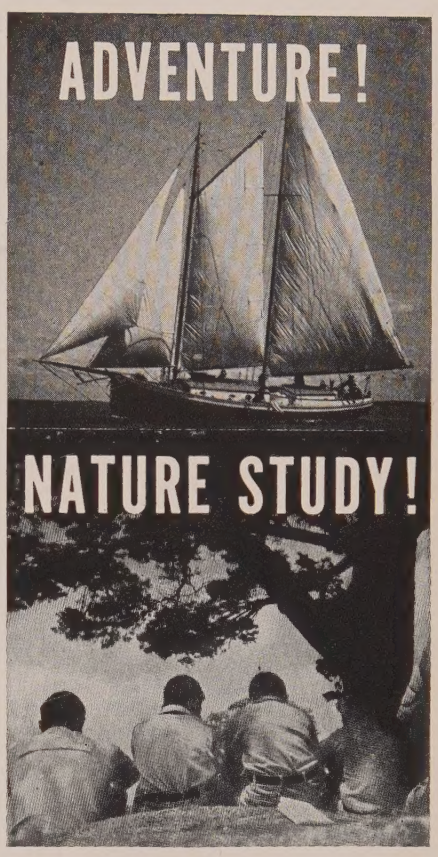

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BELL TELEPHONE SYSTEM

In April—John Burroughs

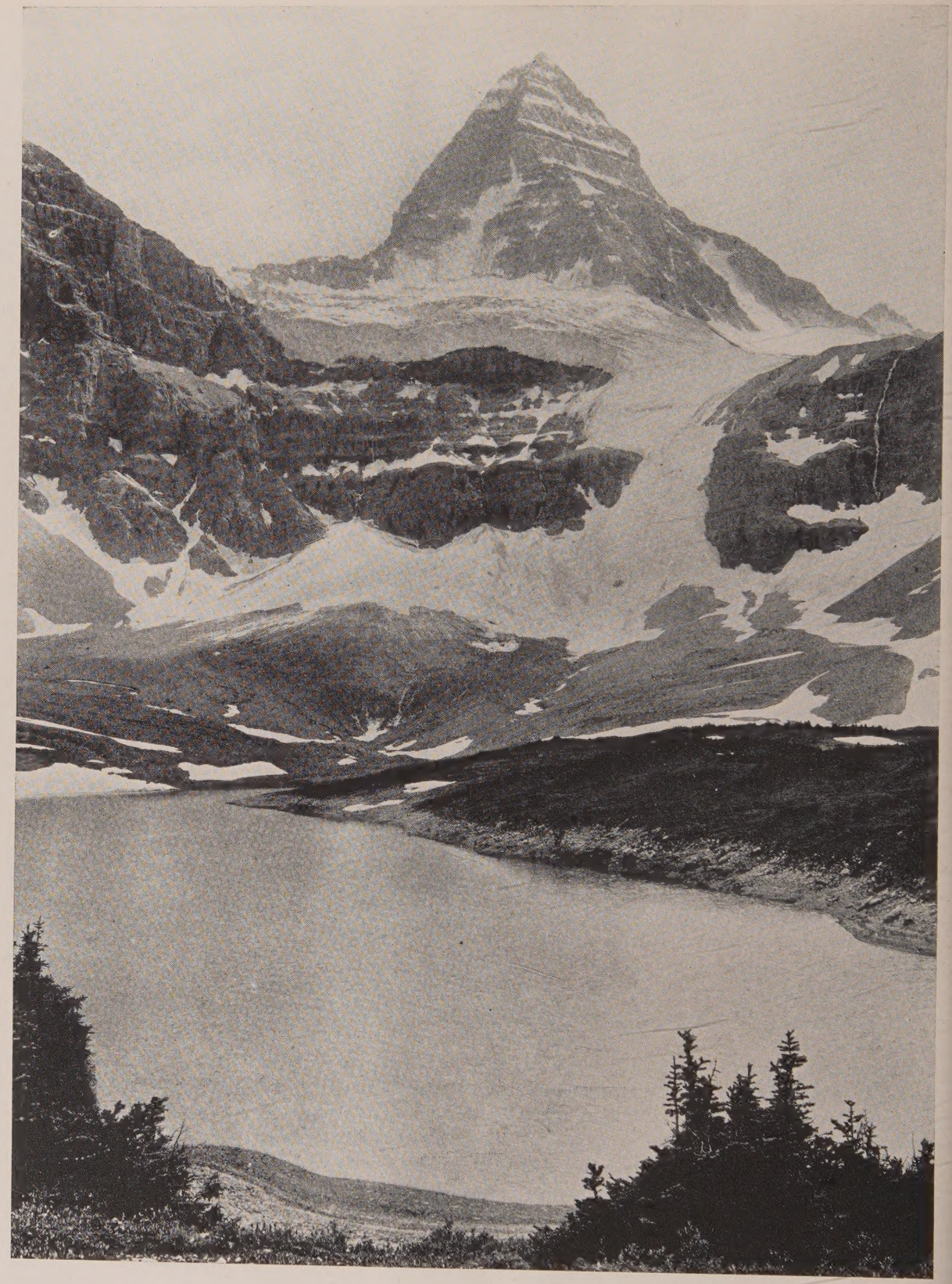
By HOWARD ZAHNISER

As Clara Barrus—physician, companion, editor, and Boswell to John Burroughs—describes the memorable occasion when the two first met, she writes: "I remember how unusual the word 'April' sounded upon his lips. Until I heard him speak it, I had not realized how beautiful a word it is." April to Burroughs was, indeed, what he once called "the mother month", and there is more than a passing interest in the April co-incidents in his life—from that third of April in 1837 (just a century ago) when he was born in a farmhouse of Delaware County, New York, to the eighty-fourth anniversary of that day, when his body was buried in the soil of that same farm, on April 3, 1921. Clara Barrus in her two volumes entitled *The Life and Letters of John Burroughs,* published by Houghton Mifflin Co., has provided an ample chronicle of those eighty-four years, and there is choice spring-time browsing to be had in these volumes by skipping from April to April—the farm boy with the hylas piping in his hand; the seventeen-year-old school teacher homesick at the sound of peepers at twilight in April; the young man looking for work in New York in 1860; April days in the Nation's capital as a Treasury clerk, friend of Walt Whitman, and a wanderer in Rock Creek Park; an April with Theodore Roosevelt in Yellowstone National Park; and another with John Muir in the West—and these only a few of the many Aprils in a life of some far travels but much wandering in his own fields and woods.

Yet the true and best Burroughs is in the two dozen volumes of his works more than in any writings about him, and perhaps the best of all April browsings is likewise in these books, also from the Houghton Mifflin shelves. An evening with these writings would be a most fitting observance of the hundredth anniversary of the birth of John Burroughs, and none of his writings could be more timely than are those on April. His volume entitled *Birds and Poets* includes an entire essay on the month. "April," he there avows, "is my natal month, and I am born again into new delight and new surprises at each return of it. Its name has an indescribable charm to me. Its two syllables are like the calls of the first birds—like that of the phoebe-bird, or of the meadow-lark." In his "Spring Jottings" in *Riverby* he writes similarly: "Welcome to April, my natal month; the month of the swelling buds, the springing grass, the first nests, the first plantings, the first flowers, and, last but not least, the first shad!" It is no wonder thus that the works of this writer are so full of the lore and the lure of April. "The Return of the Birds", first of the essays in the first and perhaps the best of his books, *Wake-Robin,* is rich with information about the birds of April. So also is "Spring at the Capital", in the same book, to at least one person the most interesting of all his essays, and one with a chronicle of April flowers that is at once helpful and charming. Of the month's weather Burroughs writes in *Locusts and Wild Honey,* in an essay called "Is It Going to Rain?", and the earlier comprehensive essay actually entitled "April" includes among other things an account of the spring odors. "I am thrilled," wrote Burroughs, "by its fresh and indescribable odors—the perfume of the bursting sod, of the quickened roots and rootlets, of the mould under the leaves, of the fresh furrows. No other month has odors like it." But there is no end in one evening to the rich harvest from the many Aprils that Burroughs lived and wrote into his books.

It was in April, too, that John Burroughs was lowered into the earth of his boyhood farm, though he had not lived to see that April or the farm toward which he had been hurrying across the country on his last return from the West. Once he had written, "I think April is the best month to be born in. One is just in time, so to speak, to catch the first train, which is made up in this month. . . . In April all Nature starts with you." Yet again he had written that "April can make even death beautiful," and thinking then of the passing of Matthew Arnold, he had asked, "Does it give a sad tinge to this April, or does April beautify and render more significant his death? It does really seem to put a seal upon him as I think of him as I go about my work and hear the happy birds, and see the grass springing." He did indeed find April the mother month, and it is with a most telling fitness that Clara Barrus applies to the passing of Burroughs the words that he himself had spoken of Emerson. "It was fit that he should pass in April . . . the month that opens the door of the more genial season. To what extent, and for how many of us, has he opened the door of a brighter and more genial clime! He was an April man, an awakener, full of light, full of prophecy, full of vernal freshness and curiosity—hardy, tender, coy, genial, frank, elusive, simple, joyous, and with the fibre and quality of the primal man."

In front of the Art Museum in Toledo, Ohio, there is a bronze figure of Burroughs, lifesize, not erect like a formal monument, but sprawled at ease in easy clothes, on a granite boulder, one arm supporting the body, the other hand shading the eyes as they look past a copper beech toward the horizon where the sun rises. The bronze figure, by C. S. Pietro, has been called "The Seer," and there is about it a quality that makes one feel that he too would like to sit there on that rock and look always toward the East. It was Burroughs Day in Toledo on April 12, 1918, when the artist's work was presented to the children of the city; Burroughs himself was there, and twenty thousand children walked past him, dropping flowers at his feet. And no one can say how many flowers of one kind or another will be dropped by other thousands yet to come as they witness such a remembrance of Burroughs, or experience the enduring works of his own art.



MIGHTY GLACIERS, IN AGES PAST, CARVED MOUNT ASSINIBOINE AND OTHER MOUNTAINS OF THE GREAT ROCKY CHAIN INTO THE TOWERING, RUGGED PEAKS THAT ALPINISTS KNOW AS "HORNS." THE NAME OF THIS PEAK COMMEMORATES THE FAITHFULNESS OF AN INDIAN GUIDE OF THIS TRIBE, WHO, BY HIS SKILL IN WOODCRAFT, SAVED A COMPANY OF EXPLORERS WHEN WEAKENED BY STARVATION.